FINAL REPORT

19970163

COMMUNITY WATERSHED MANAGEMENT FOR THE MAINTENENCE OR IMPROVEMENT OF WATER QUALITY

December 2000
Funded by the Agri-Food Innovation Fund

Prepared by: Ag & Agri-Food Canada

AGRI-FOOD INNOVATION FUND

Canada

Saskatchewan

Table of Contents

103-07375/

Acknowledgements 3
What are our Goals and Objectives? 5
Long Range Plan 5
Introduction and Executive Summary 6
- Introduction 6
- Executive Summary 7

Overview of Projects 1997-2002 9
- Surface Water Reports 9
- Ground Water Reports 18
  - Private Well Testing 18
  - Piezometers – Sewage Lagoon Study 18
- Fish Studies 21
- Land-based Projects 23
  - Caswell Riparian Area Project 23
  - Brewer Alternate Water Supply 24
  - Palendat Alternate Water Supply 26
  - Big Stone Creek Grazing Project 27
  - Converting Ideas into Practices 28
- Advisors' Commentary Articles 30

Perspectives from Sponsoring Organizations 32
- Agriculture and Agri-Food Canada's Perspective on the Big Shell Lake Watershed Community Management Project 32
- Sask Water 33
- Sask Ag & Food 34
- Saskatchewan Environment and Resource Management (SERM) 34

Appendices 36
- Appendix A: President's Messages 36
- Appendix B: Chronological History of Meetings, Seminars and People 45
- Appendix C: Survey Data 47
- Appendix D: Involvement with Other Groups 48
  - Nature Saskatchewan 48
  - The Saskatchewan Network of Watershed Stewards (SNOWS) 50
- Appendix E: Seminar and Convention Reports 51

Acknowledgements

We would like to acknowledge and recognize the people who have been associated with the BSLWSA and were instrumental in our formation.

Thanks to the Canada-Saskatchewan Agri-Food Innovation Fund for providing the main funds so that we could carry out our projects.

For their efforts and valuable guidance, we thank Les Hunt and Dianna Vaagan who collaborated with Don Dill from Sask Water to help form this organization.

Don Barilla, our first president, who led us in formulating our by-laws, goals and objectives.

From Agriculture and Agri-Food Canada (AAFC): Malcolm Black, Senior Soil Conservationist, for initiating the project; Karen Benjaminson, District Soil Conservationist, who was responsible for all aspects of our funding and helping to initiate our programs; Garet Cormin for guidance and support; Charles Salisbury, the Assistant Soil Conservationist; Stephen Gibbard, Agricultural Engineer.

Brian Harris, Saskatchewan Agriculture and Food (SAF), who has been a contributor and a valued advisor from the beginning.

Len Sinclair, Saskatchewan Environment and Resource Management (SERM), for enthusiasm and support for our project and leadership advice on formulating our surface water monitoring programs and providing the manpower and equipment, as well as technicians Brenda Thurston and Todd Swenson

John Weir, Gord Sedgewick and Brett Diemert from the SERM West Boreal Region for their contribution to our fish habitat studies.

James Rusak and Peter Leavitt, Department of Biology, University of Regina, for the extensive analysis of the lake bottom sediment.

Clive Callaway, director of the Living by Water Project and Margaret Skeel from Nature Saskatchewan for leadership and guidance in setting up our Shoreline Ambassador weekend along with Amie Pettit and Tara Schmidt.

Les Hunt, executive director of the Provincial Association of Resort Communities of Saskatchewan (PARCS). Through the PARCS association, Les has always been a strong supporter of Lake Stewardship and the BSLWSA.

We also acknowledge and recognize all other associations and watershed stewardship groups that have shared information with us: Stewards of Jackfish-Murray Lake, Friends of Good Spirit, PARCS, North American Lake Management Society (NALMS), Federation of Ontario Cottagers Association (FOCA), Friends of the Saskatchewan River Basin, the Canadian Water Resources Association. Their contributions and support has been greatly appreciated and their experiences have been a guideline for us to follow.

Thanks to all past and present board members, especially the original members: Doug Wilson, Ralph Banda, Linda Caswell, Carl Brown, and Bob Norman, who have remained involved from the inception.

Special thanks to Anne Wilson who was instrumental in the formatting and designing of our brochure and the News of the Shed and to Lillian Banda for setting up our membership database and the accounting system. We also recognize the assistance of Irene Giesbrecht, water technician, and Rebecca Kennel, our co-ordinator.

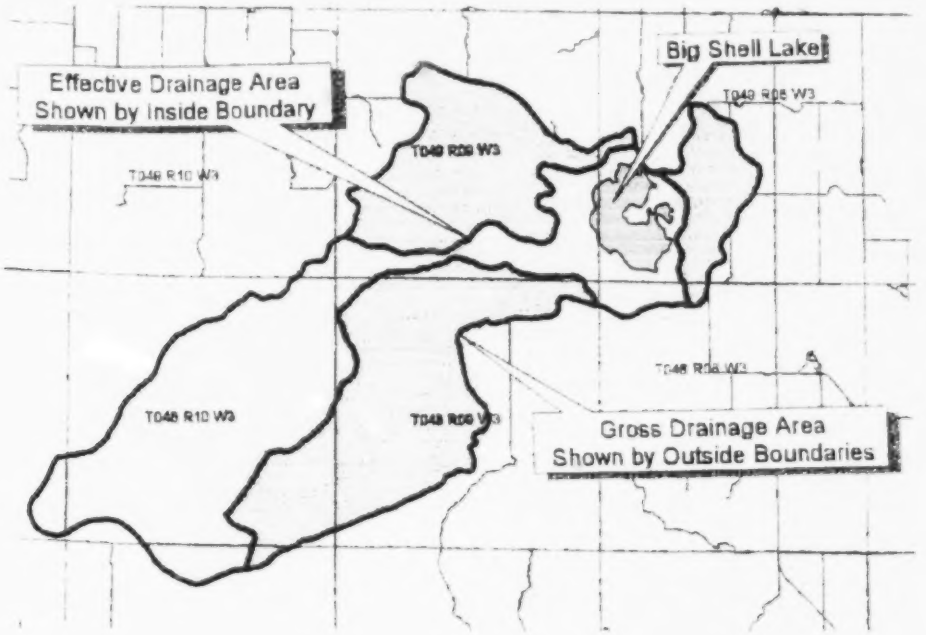
Thanks to the Shell Lake School, the Village of Shell Lake and the Resort Villages of Echo Bay and Big Shell for the use of their meeting spaces for board meetings and AGMs.

Strong and successful organizations need a strong foundation, with encouragement and support from many people. We feel that we have had that and we thank you all.

What is the BSLWSA?

A representative local stakeholder group formed to promote lake and watershed management and to make local decisions on the administration of funding assistance through the Agri-Food Innovation Fund.

The Agri-Food Innovation Fund Board of Directors assigned the role of lead agency to Agriculture and Agri-Food Canada (AAFC), headed by the Prairie Farm Rehabilitation Administration (PFRA). This fund provided resources for a pilot project to assess and manage water quality issues within the Big Shell Lake Watershed. This initiative involved an assessment of water quality issues; selection and demonstration of various remedial options; and development and implementation of a locally acceptable plan to address and monitor water quality issues.



LOCATION OF BIG SHELL LAKE: Big Shell Lake is located approximately 150 km north of Saskatoon, 100 km west of Prince Albert and 150 km northeast of North Battleford in Saskatchewan, Canada.

Mission Statement

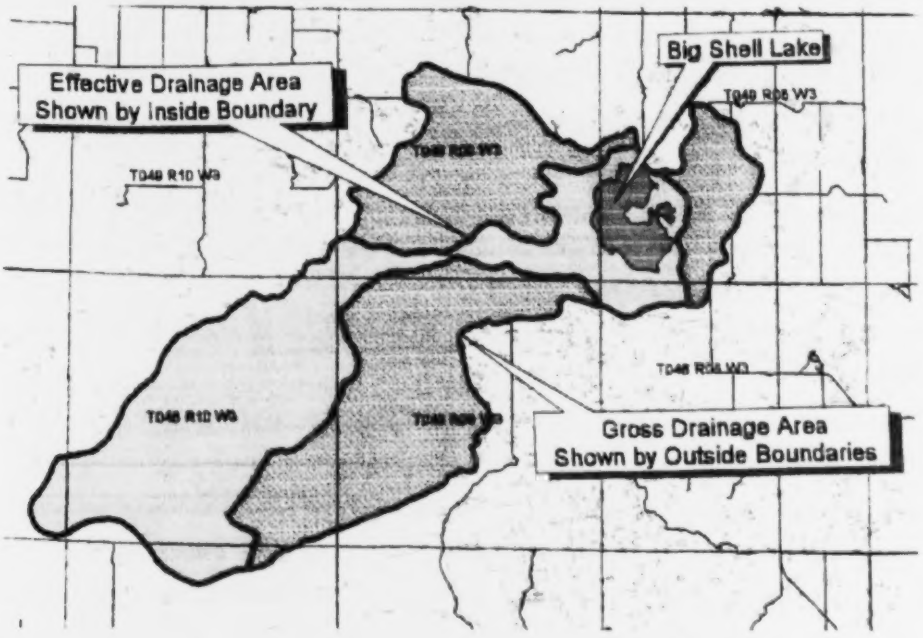
The Big Shell Lake Watershed Stewardship Association Inc. was formed for the preservation and enhancement of the water quality within the Big Shell Lake Watershed for present and future generations.

Big Shell Lake Watershed Stewardship Association Inc.
Box 77, Shell Lake, SK S0J 2G0 Canada
Web page: http://bslwsa.icomm.ca/
Email: bslwsa@icomm.ca

What is the BSLWSA?

A representative local stakeholder group formed to promote lake and watershed management and to make local decisions on the administration of funding assistance through the Agri-Food Innovation Fund.

The Agri-Food Innovation Fund Board of Directors assigned the role of lead agency to Agriculture and Agri-Food Canada (AAFC), headed by the Prairie Farm Rehabilitation Administration (PFRA.) This fund provided resources for a pilot project to assess and manage water quality issues within the Big Shell Lake Watershed. This initiative involved an assessment of water quality issues; selection and demonstration of various remedial options; and development and implementation of a locally acceptable plan to address and monitor water quality issues.



LOCATION OF BIG SHELL LAKE: Big Shell Lake is located approximately 150 km north of Saskatoon, 100 km west of Prince Albert and 150 km north/east of North Battleford in Saskatchewan, Canada.

Mission Statement

The Big Shell Lake Watershed Stewardship Association Inc. was formed for the preservation and enhancement of the water quality within the Big Shell Lake Watershed for present and future generations.

Big Shell Lake Watershed Stewardship Association Inc.
Box 77, Shell Lake, SK S0J 2G0 Canada
Web page: http://bslwsa.icomm.ca/
Email: bslwsa@icomm.ca

What are our Goals and Objectives?

From Vol. 1, Winter 1997/98 - *News of the Shed*

- Develop a plan to initiate action and develop the Association.
- Provide a medium for the residents of the BSLWSA to come together to learn, share and exchange information and views concerning stewardship.
- Assess current water quality issues and concerns that have been identified.
- Make sure everyone in the Watershed is aware of the issues that effect water quality within the Watershed.
- Develop a plan to continue monitoring water quality and create an awareness and education program in the community of the BSLWSA regarding water quality.
- Develop a plan to receive input and feedback from the BSLWSA.
- Work co-operatively with all levels of government to utilize all services they may provide to help us achieve established goals.
- Promote a sense of community in the Watershed and an awareness of the Association, Mission Statement, Principles and Goals.
- Promote a positive and co-operative approach towards management of water quality within the Watershed.
- Ensure community control and involvement at all levels of the project.
- Promote fair and suitable practices and implement practical and acceptable solutions to issues.
- Identify causes that are detrimental to the water quality.
- Take remedial action to correct causes and existing practices that are detrimental to the water quality of Big Shell Lake.

Long Range Plan

Mission Statement

To preserve and enhance the water quality of the Big Shell Lake watershed for present and future generations.

We will:

- Continue to promote and fulfill the goals and objectives of the constitution of the BSLWSA.
- Work towards continued monitoring of the water quality of Big Shell Lake.
- Continue to access our government advisors for their advise and expertise.
- Continue with our associations' memberships in and support of other watershed and lake stewardship associations, including NALMS, PARCS, SNOWS, etc.
- Make ourselves available to all other associations as advisors.
- Continue to produce and circulate the information newsletter, *News of the Shed* annually to all members of the BSLWSA.
- Continue to promote sound lakeshore and riparian area management and follow the guidelines of the Living by Water Project.
- Approach our government partners in five years to carry out monitoring of surface and ground water to compare to our current data.
- Reactivate the piezometer wells at current dumpsites when the resort sewage lagoons are relocated to sample, analyse and compare data.
- Update and maintain our web site and write articles for local newspapers and publications.

Introduction and Executive Summary

By Doug Wilson, President

Introduction

Big Shell Lake is a recreational lake body within a watershed that includes agricultural land, two resort villages, acreages, and an unorganized hamlet. The Big Shell Lake Watershed Stewardship Association Inc. was formed Sept. 15 1997 as a pilot project in lake and watershed management. The purpose is to assess and manage water quality within the Big Shell Lake watershed.

An orientation meeting was held on May 20, 1997 at the Resort Village of Big Shell community hall convened by Malcolm Black from the Regina PFRA office. Les Hunt and Diana Vaagan organized the meeting as the result of an initial contact made by Don Dill with the two resort councils of Big Shell and Echo Bay as well as the rural municipalities of Spiritwood, Leask, and Meeting Lake. This study project was supported by: Don Dill from Sask Water, Len Sinclair from Saskatchewan Environment and Resource Management (SERM), Brian Harris from Saskatchewan Agriculture and Food (SAF), and Garet Cormin from the lead agency, Department of Agriculture and Agri-Food Canada (AAFC) through the Agri-Food Innovation Fund (AFIF).

The result of this meeting was the eventual formation of The Big Shell Lake Watershed Stewardship Association Incorporated (BSLWSA). The BSLWSA board of directors, representing the rural municipalities and the resort villages, then became responsible for the management of the available funds through the AFIF contribution agreement. The board was also to plan and organize all monitoring and remedial projects.

Why Big Shell Lake?

Prior to the formation of the BSLWSA, two studies were conducted within the Big Shell Lake shoreline boundaries. In 1987, a lake usage study was conducted at the request of the Resort Villages of Big Shell and Echo Bay and the R.M. of Spiritwood. The government partners in this study were: Sask Water, Saskatchewan Agriculture, Saskatchewan Parks and Renewable Resources, and the Community Planning Department of Saskatchewan Urban Affairs.

The final report for this 1987 Lake Management Study indicated many of the concerns that the current BSLWSA board have tried to address: recreational development around the lake, water quality, habitat, shoreline protection, water level, and the impact of agriculture on the lake.

In the summers of 1993-94 SERM fisheries biologists conducted several lake patrols to assess the impact on fish habitats by the increasing numbers of alterations, both authorized and unauthorized, occurring along the shoreline. The actual fieldwork was carried out in the summer of 1996. The Big Shell Lake Fish Habitat Assessment Report indicated that due to the intense development of cottages only 58% of the lake shore was still in its natural condition. The report also recommended no further development and that 13 km of undeveloped shoreline should be preserved.

These two studies made the choice of Big Shell Lake as the pilot for a lake stewardship program very attractive as the information would provide a benchmark against which future actions could be compared. There was also strong evidence of stakeholder interest and support within the Big Shell Lake resort and farm communities.

How Have We Done?

The BSLWSA has shown great success in many areas and had some disappointments in others. A major success has been an increased awareness of the BSLWSA and what we are trying to accomplish within our community. Not only are we becoming well known in our community, we are also becoming well known outside the Big Shell Lake boundaries. Our three-day Shoreline Ambassador Certification workshop, co-sponsored with Nature Saskatchewan's Living by Water project, was our greatest success at promoting shoreline management awareness.

We have seen an annual increase in attendance and participation at our annual general meetings. There has also been an increase in "coffee row" conversations. Questions are more forthcoming and interest is increasing. One of the most satisfying remarks that the board

hears is, "How quickly the association came together and how much was accomplished in a short time."

As with any association's efforts there is always the possibility of disappointment. We have had some disappointments, and though not too significant, they are still a concern for the board. The board sponsored a Project Wet workshop, but had to cancel it because of lack of interest. The Xeriscaping Seminar held during the summer of 1998 was poorly attended, with the audience made up primarily of the BSLWSA board. The same was true of the one-day seminar organized in our second year with an impressive group of presenters.

The board has also expressed concerns about the poor response of residents to become paid members in the BSLWSA. The board anticipated a greater response to our membership drive, but percentage-wise (members to residents) our response has been better than what other similar groups have achieved. Others have told us they would be happy to have the same percentages we do. Membership is an issue that the board will continue to target.

It will be some years down the road before we will see if our programs and remedial measures have made an impact on the water quality of the watershed. The goals and monitoring objectives of our long-term management plan will help to indicate whether we are on the right track.

Why Should You Support Lake Stewardship?

Lake Stewardship will become the catch-phrase for all of us in "lake country". Protection of the environment and water quality will increasingly be the responsibility of the community. Each area and watershed differs from the other in their problems and solutions, but most everyone's ultimate goal is to improve or maintain our environment and water quality. The combined effect of alterations by many shoreline property owners on a lake destroys habitat and water quality, the results of which can lead to declining fish and wildlife populations. Cleared shorelines aren't good for the water quality of our lakes.

We tend to think that our project in the Big Shell Lake Watershed seems small and insignificant. We **are** a small but very important and necessary project for the long-term quality and health of our watershed environment. Organizations such as ours are leading the way with their approach to "Ecosystem Management" into the 21st century and during this century we will find ever-increasing importance placed upon environmental issues and preservation of water quality. The BSLWSA board of directors and the government agencies we are partnered with will continue to work within our long-term plan towards a healthy environment and a good quality water supply for generations to come.

We invite you to read these reports about the Big Shell Lake watershed to assist you in forming sound shoreline and environmental practices in order to protect water quality for present and future generations.

We will continue to:

EVALUATE, EDUCATE, REMEDIATE.

EVERYTHING AFFECTS EVERYTHING ELSE

Executive Summary

Since the formation of the BSLWSA five years ago the board has overseen surface and ground water sampling, sediment sampling, agricultural and shoreline projects, fish habitat studies, as well as educational and awareness programs. This report provides you with the details of these projects as published in the *News of the Shed* as well as a few final articles.

Surface Water Sampling

Water samples were collected from the inlet creek and designated collection stations on the main lake and in Echo Bay in the spring, summer and fall of most years of our program. Each lake sampling site had three samples taken: surface, mid depth, and bottom. We also collected full depth samples from the three lake stations through the ice in January of 2001. The concluding data results showed very little chemical difference in water quality throughout the year.

Sediment/water interface nutrient sampling was planned for the summer of 2000, but this was not completed due to a shortage of resources.

The water quality study that was conducted for Big Shell Lake indicates that there are high levels of nutrients in the lake water. These high levels of nutrients are the result of inputs from various external and internal sources, though the extent and nature of those inputs is difficult to determine. Results of the data collected during our five-year monitoring program will give us a benchmark that will indicate what is happening with Big Shell Lake's water chemistry.

Sediment Sampling

Core samples were taken during 2000/01 from the lake bottom at two sites on the main lake in approximately 45 feet of water depth and one core sample from Echo Bay at approximately 18 foot depth. Dr. Peter Leavitt at the University of Regina analysed these samples. The data report, which detailed the changes that have occurred to the lake bottom over many decades, was presented at our July 2001 annual general meeting. Results indicate the sediment chemistry has not changed greatly over the past 150 years, though some differences were noted beginning in the 1970s. Causes of this were not identified. This information is vital in that it adds to the environmental history of Big Shell Lake.

Ground Water Sampling

Residential wells of resort residents and neighbouring acreages were tested in 1998 and in 2001. Some wells showed high coliforms and a few also had very high *E. coli* counts, indicating a possibility of sewage contamination of the ground water.

In order to trace some of the sources of the contamination, six test holes were dug at the R.V.'s of Echo Bay and Big Shell sewage dump sites in January and February, 1999. Three piezometer wells were installed at each sewage dump site and sampling of these wells at various intervals throughout the year indicated that there was leakage of sewage into the surrounding ground water, the most serious being at the Echo Bay site. A complete report and assessment of the data was made available to the resort village councils and preliminary discussion has begun between the councils about the sewage concern. By working together and pooling their resources, a properly designed and constructed new lagoon should solve some of the problems of ground water contamination.

Fish Population Assessment

A fish population study was conducted by SERM fisheries biologists in 1998 to update the earlier records. The study concluded that the walleye population in Big Shell Lake is very good and is being maintained by natural reproduction. When comparing the data in both studies, it does not appear that the existing lakeshore development has negatively impacted the sport fish population in Big Shell Lake. However, the ongoing protection of the critical fish habitat is essential to maintain this healthy fish population.

In September of 2000 and June of 2001 a live netting program was conducted. This data was presented at the 2001 AGM.

SERM fisheries biologists were also concerned about the long-term effect the late summer heavy surface cover of blue-green algae may have on future fish reproduction.

Land-Based Projects

Based partly on the results from the surface and ground water sampling, the following remedial projects were carried out: the relocation of corrals and a cattle wintering site; the development of alternate watering sources for cattle on the west side of the lake and for sheep along the creek; and the removal of manure adjacent to the creek. Our next project will be to enhance the riparian area along the creek and to improve the forage productivity by implementing a rotational grazing system and developing alternate watering options.

Living By Water Project

The BSLWSA was involved with Nature Saskatchewan's Living by Water project, which involved shoreline assessment and environmental impact evaluation for shoreline residents of Big Shell Lake. This was held on July 21st-23rd, 2000 and was part of the nationally launched Shoreline Ambassador Certification Program.

This three-day workshop was extremely successful and informative and was a great social event for all that participated.

Summary

You can see that these few years have been very busy. We have gathered valuable information and hopefully we have started something good for current and future users of Big Shell Lake. Our efforts should also prove to be of great value to all lake residents in Saskatchewan and Canada, as Big Shell Lake is probably representative of many other lakes. What we have found out about the water quality of Big Shell Lake is interesting as well as eye opening. We have discovered many areas of concern and also have found that there are many good qualities about this lake body. The success of this project can be attributed to the community working in cooperation with government partners towards a common goal.

Overview of Projects 1997-2002

Excerpted from issues of News of the Shed.

Surface Water Reports

Vol. 1 Winter 1997/98 – SERM Water Analysis Study of Big Shell Lake: Summer/Fall 1997

by Brenda Thurston

Trophic State

The word "trophic" literally means nourishment (levels of nitrogen and phosphorous). The range of classification is oligotrophic (low levels of nutrients) to eutrophic (highly fertile). Big Shell Lake can be classified as mesotrophic (intermediate in fertility) in May to eutrophic (highly fertile) in August and September.

Dissolved Oxygen

The data on dissolved oxygen (D.O.) profiles at Big Shell Point and Camp sites shows that the depth at which dissolved oxygen becomes less than 5 mg/L (below Water Quality objectives) and less than 1 mg/L (anoxic) varies with the season. The depth which D.O. was less than 5 mg/L was only 7 meters below the water surface on July 17, 1997 compared to 12 meters on September 23 and 14 meters on June 12. At the Echo Bay site the dissolved oxygen levels were above the 5 mg/L at most times.

The anoxic zone varies with the season and can have an adverse/lethal effect on the growth and survival of fish and benthic invertebrates. This change in the depth of dissolved oxygen is related to the processes of photosynthesis and aeration (oxygen producers) and respiration (oxygen consumers) in the water column. The distribution of dissolved oxygen from the surface to the lower depths is governed by the process of diffusion. Temperature plays a major role in the solubility of oxygen in water and affects the rate of biological process of respiration.

Hardness

According to the Saskatchewan Water Quality objective, the water from all sites is "very soft."

pH

The pH range for the 3 main sites range from 8.47 - 8.87 pH units, which are either on the upper side or above the Water Quality objectives (6.5 - 8.5 pH units.)

Conductivity

The total salts in the water at all sites are quite normal, both as source of drinking water as well as for irrigation purposes. Sodium absorption ratio is very low indicating that the water is suitable for irrigation for most types of soils.

Heavy Metals

The data from all sites shows that the amount of heavy metals are below the Water Quality objectives and there is no major contamination of heavy metals in this lake.

Conclusion

Water quality data collected to date indicates conditions that represent nutrification of the water body from sources that are not natural. Some of the sources have yet to be identified and quantified. Inflows of nutrients that are above natural levels will increase the rate at which a lake degrades from a pristine water body to a bog. Algae blooms and weed growth are visible indicators of over nutrification and result in degradation of lake water quality. Further examination of the watershed is required to identify and quantify sources of nutrient loading to Big Shell Lake.

Vol. 2 Spring 1998 – Report on the BSLWSA 1997 Study

by Leonard Sinclair

The data collected during the spring, summer, and fall of 1997 on the water, sediments, and activities within the drainage basin of Big Shell Lake have been compiled and presented in a report to the Board of Directors of the BSLWSA.

The conclusions drawn from the data collected indicate that the water quality in Big Shell Lake dete-

riorates over the summer months due to a yet to be determined nutrient source. The nutrients cause excessive weed growth which in turn deplete the oxygen in the water column which can result in low fish productivity and cases of swimmer's itch or other health-related issues.

Lakes that have high nutrient levels typically have excessive weed growth and algae blooms in July and August and may smell stagnant.

Sources of nutrients are typically from sewage, grey water, agricultural land runoff, animal manure and the recycling of nutrients contained within the sediments in the lake bottom.

Brenda Thursten taking water samples

The first year of study undertook to determine the concentrations of various chemical constituents contained in streams entering the lake as well as within the lake itself. This was what was termed "base line evaluation". The second year of study will be to try and assess and quantify the amount of nutrients being contributed from the various nutrient sources.

Potential remediation measures will be looked at once the assessments are completed.

It is important for the success of this study and for the protection of this valuable resource, the Big Shell Lake Drainage Basin, that all people get involved and support those who are involved.

Vol. 3 Winter 1998/99 – Big Shell Lake Water Quality Summary 1998

by Brenda Thurston

Overall, the lake water chemistry for 1998 has not changed as compared to the 1997 results. The water quality is quite good. The only fluctuations in levels are those of the nutrients, which include various form of phosphorous and nitrogen.

Nutrients are fertilizing compounds which stimulate and sustain the growth and development of aquatic plants and algae. Nitrogen and phosphorous compounds are the two most significant nutrients.

The nutrient concentrations observed during this year's study, show that the lake is in mesotrophic (moderate productivity) in May and becomes mesoeutrophic to eutrophic (moderate to high productivity) during August, which results in a significant reduction in dissolved oxygen in the deeper portions of the lake, excessive weed growth and algae blooms. Nutrient levels for November nutrient results show that the lake is in a Eutrophic (high Productivity) state.

Sediment samples were taken from stations 2 and 3, Echo Bay and the 15 meter hole respectively. The results show that phosphorous concentrations were high and uniform throughout the entire 40 centimetre core sample. This is an indication that there is a high degree of internal loading of phosphorous. Phosphorous is released at the sediment water interface under a variety of conditions which include: lake turnover in spring and fall and mixing through windy conditions, low levels of dissolved oxygen, and, through various chemical reactions that take place at this location.

Vol. 4 Fall 1999 – Big Shell Lake Water Quality Report 1998

by Brenda Thurston and Len Sinclair

Data that was collected from May 15 to November 3, 1998 will be used in the following sections to describe the general water quality of Big Shell Lake in terms of the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*.

WATER QUALITY

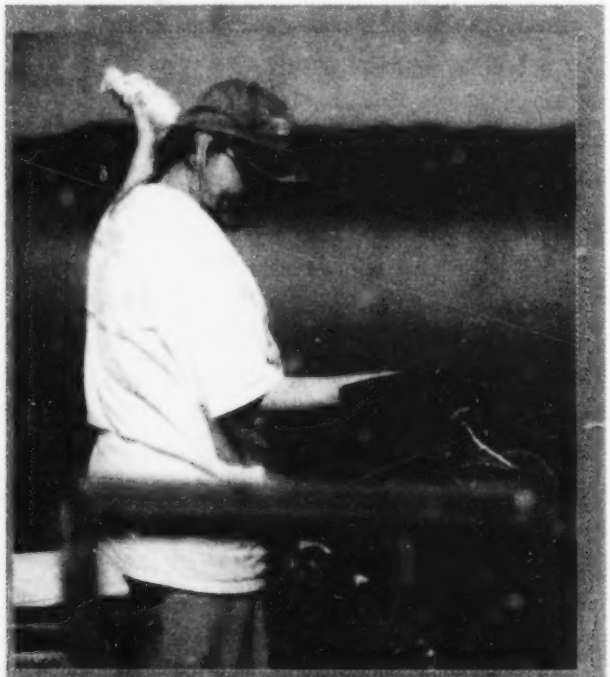
Dissolved Oxygen

Dissolved oxygen is a fundamental requirement for aquatic life, without it there would be no fish or plants. Dissolved oxygen and temperature profiles were conducted on August 5 and 25, 1998 in order to determine

riorates over the summer months due to a yet to be determined nutrient source. The nutrients cause excessive weed growth which in turn deplete the oxygen in the water column which can result in low fish productivity and cases of swimmer's itch or other health-related issues.

Lakes that have high nutrient levels typically have excessive weed growth and algae blooms in July and August and may smell stagnant.

Sources of nutrients are typically from sewage, grey water, agricultural land runoff, animal manure and the recycling of nutrients contained within the sediments in the lake bottom.



Brenda Thursten taking water samples

The first year of study undertook to determine the concentrations of various chemical constituents contained in streams entering the lake as well as within the lake itself. This was what was termed "base line evaluation". The second year of study will be to try and assess and quantify the amount of nutrients being contributed from the various nutrient sources.

Potential remediation measures will be looked at once the assessments are completed.

It is important for the success of this study and for the protection of this valuable resource, the Big Shell Lake Drainage Basin, that all people get involved and support those who are involved.

Vol. 3 Winter 1998/99 – Big Shell Lake Water Quality Summary 1998

by Brenda Thurston

Overall, the lake water chemistry for 1998 has not changed as compared to the 1997 results. The water quality is quite good. The only fluctuations in levels are those of the nutrients, which include various form of phosphorous and nitrogen.

Nutrients are fertilizing compounds which stimulate and sustain the growth and development of aquatic plants and algae. Nitrogen and phosphorous compounds are the two most significant nutrients.

The nutrient concentrations observed during this year's study, show that the lake is in mesotrophic (moderate productivity) in May and becomes mesotrophic to eutrophic (moderate to high productivity) during August, which results in a significant reduction in dissolved oxygen in the deeper portions of the lake, excessive weed growth and algae blooms. Nutrient levels for November nutrient results show that the lake is in a Eutrophic (high Productivity) state.

Sediment samples were taken from stations 2 and 3, Echo Bay and the 15 meter hole respectively. The results show that phosphorous concentrations were high and uniform throughout the entire 40 centimetre core sample. This is an indication that there is a high degree of internal loading of phosphorous. Phosphorous is released at the sediment water interface under a variety of conditions which include: lake turnover in spring and fall and mixing through windy conditions; low levels of dissolved oxygen; and, through various chemical reactions that take place at this location.

Vol. 4 Fall 1999 – Big Shell Lake Water Quality Report 1998

by Brenda Thurston and Len Sinclair

Data that was collected from May 15 to November 3, 1998 will be used in the following sections to describe the general water quality of Big Shell Lake in terms of the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines.*

WATER QUALITY

Dissolved Oxygen

Dissolved oxygen is a fundamental requirement for aquatic life, without it there would be no fish or plants. Dissolved oxygen and temperature profiles were conducted on August 5 and 25, 1998 in order to determine

the thermal layers of the water column and identify possible oxygen deficit. The data on dissolved oxygen profiles of Station 3 showed that the depth at which dissolved oxygen becomes less than 6 mg/L on August 5, is between 7 and 8 metres. On August 25, at Station 1, the depth at which dissolved oxygen becomes less than 6 milligrams per litre (mg/L), is between 8 and 9 metres. Levels of dissolved oxygen were less than 0.1 mg/L, 2 metres above the sediment-water interface. *Saskatchewan Surface Water Quality Objectives* recommend "a minimum concentration of 6 milligrams per litre, in order to preserve water quality for the protection of aquatic life."

Water Sampling Stations, Big Shell Lake

Station 3 has very little oxygen in the lower half of the water column, despite the cooler temperatures. An anoxic environment is found 2 metres above the sediment-water interface on these sample dates. Several different chemical reactions take place within the sediments when levels of dissolved oxygen fall below 1 mg/L. Phosphorous release from sediments occurs because of these chemical reactions. The decomposition of organic and an association with sediment bound iron are two reactions that can cause phosphorous release. If lake stratification occurs due to wind, phosphorous is released from the lower portions of the lake into the overlying waters. Manganese and iron are also released from the sediments during these anoxic periods which can cause odour problems.

Total Dissolved Solids

The sum of the dissolved ions in water is closely related to the salinity in water and is usually expressed as total dissolved solids (TDS). Salinity of the water is most important with regards to various agricultural uses such as irrigation or livestock watering. TDS values for Big Shell Lake during August 1998 ranged from 273 mg/L to 348 mg/L. These values indicate relatively low salinity and good chemical quality. These salinity levels would not affect any of the expected uses of the water in Big Shell Lake.

Heavy Metals

Levels of heavy metals at all stations were below *Surface Water Quality Objectives*, and should not interfere with any of the intended uses of the lake.

NUTRIENTS

"The nutrients to be sampled in a lake study are those that contribute to plant growth, such as nitrogen and phosphorous. Phosphorous is most often the key nutrient in determining the quantity of algae and other aquatic plants in a lake. In comparison to some of the other nutrients required by aquatic biota, phosphorous is least abundant and commonly the first element to limit biological activity." (Wetzel 183)

Surface Water Quality Objectives state that "phosphorous or nitrogen or other nutrient concentrations should not be altered from natural levels by discharges of effluents such that nuisance growths of aquatic weeds or algae results".

Total Phosphorous

Total phosphorous is the total sum of organic and inorganic phosphorous. In most lakes, the amount of algae in the water is a function of the amount of phosphorous. This is because phosphorous is in the shortest supply of all the nutrients that lake plants need for growth. When it runs out, the algae population can no longer increase and when the algae dies off the phosphorous is again returned to the water and sediments to be reused. A larger phosphorous supply usually results in more algae and aquatic weed growth.

Subsurface grab samples were taken May 15 and May 20, 1998 at Station 1, 2 and 3. Total Phosphorous levels ranged from 0.04 milligrams per litre (mg/L), to 0.20 mg/L. These concentrations show a high degree of productivity within the lake.

Orthophosphate (PO_4^{-3})

"Phosphorous in waters is present in several soluble and particulate forms, including organically bound phosphorous, inorganic polyphosphates, and inorganic orthophosphate. These orthophosphate are usually ions of phosphoric acid. At pH

concentrations of most natural waters (less than pH 9.0), the dihydrogen and monohydrogen phosphate ions are prevalent, although analytical techniques usually employed do not distinguish between ionic states and all inorganic phosphate is usually considered as PO_4^{-3}." (Lind 64)

Orthophosphate was the parameter tested for at all stations at Big Shell Lake. The levels ranged from 0.02 to 0.06 mg/L.

An orthophosphate profile was done at Station 3 at two metre increments. The profile shows that there are greater concentrations of orthophosphate at lower depths of the water column, which may be an indication that it is being released from the sediment.

Ammonia-Nitrogen (NH_3)

"Ammonia is a product of the microbiological decay of animal and plant, proteins. When ammonia is found in surface water it is usually the result of domestic sources. In most healthy freshwater systems, ammonia is present in low concentrations, usually less than 1.0 mg/L; it is the preferred form of nitrogen for uptake by algae and plants. Since ammonia is readily bioavailable as a nutrient for plant uptake, it may contribute greatly to the increase of productivity." (Task Force on Canadian Water iv-8)

Ammonia may enter surface water through soil erosion and/or agricultural runoff.

The levels for ammonia-nitrogen varied from 0.02 mg/L to 0.08 mg/L for all stations during the 1998 sampling season.

Secchi Disk Transparency

A secchi disk was used to measure the amount of suspended material such as algae and sediment (turbidity) in the water. These materials influence the depth to which the secchi disk can be seen, value increases as clarity of the water increases. The secchi disk measurements varied from 1.9 m to 2.8 m in August.

TROPHIC STATUS

Trophic status may be evaluated periodically to determine whether or not a significant change in status has occurred over time. Although eutrophication is a natural characteristic of aging in virtually all lakes, it is a slow process which can be accelerated by man-made influences such as wastewater discharges, drainage, agricultural practices, development, etc.

In order to classify lakes according to their trophic status, several factors have to be considered which at certain levels indicate that a lake belongs in one of the above categories. The most commonly used "trophic indicators" are:

- nutrients (nitrogen and phosphorous),
- chlorophyll "a" (correlated to algal weight filtered from water) and
- secchi disk transparency (water clarity).

Since the values for these trophic indicators can be highly variable in Saskatchewan lakes, the province has not established specific water quality objectives for these parameters.

The trophic status for 1998 has been established by using total phosphorous as an indicator. Chlorophyll "a" is an important factor in establishing a trophic status, however, analysis for this parameter was not conducted in 1998 and will not be used. Secchi disk transparency was recorded in August only and will not be used as a trophic indicator in this report.

Using levels of total phosphorous as a guideline in establishing a trophic status for 1998, Big Shell Lake can be classified as Eutrophic (high productivity) to Hypereutrophic (excessive productivity) from May through to November. Levels for all stations range from 0.04 and 0.2 mg/L. Results showing levels of <0.01mg/L on May 27, 1998 are questionable, and have not been included in this report.

Observations were noted during the 1998 study, that all shorelines were covered with extensive weed growth and that the entire bottom of Echo Bay was covered in water milfoil and pondweeds.

CONCLUSION

The water quality study that was conducted for 1998 at Big Shell Lake indicates that there are high levels of nutrients. These sources stem from various external and internal sources. The mass amounts of submergent and emergent vegetation and algae are the result of nutrient loading. The relative fertility of the lake can be classified as mainly eutrophic (highly productive) for this sampling period. The parameters that were used to establish a trophic status were limited, and this assessment was based on the data that was obtained in 1998.

Works Cited

Lind, Owen T. *Handbook Of Common Methods in*

Limnology. St. Louis: The C.V. Mosby Company, 1974.

Saskatchewan. Environmental P Protection Branch. *Big Shell Lake Fish Habitat Assessment*. Saskatoon: Saskatchewan Environment and Resource Management, 1996.

Saskatchewan. Environmental Protection Branch. *Municipal Drinking Water Guidelines*. Regina: Saskatchewan Environment and Resource Management, 1995.

Saskatchewan. Environmental Protection Branch. *Surface Water Quality Objectives*. Regina: Saskatchewan Environment and Resource Management, 1997.

Wetzel, Robert G. *Limnology*. Philadelphia: W.B. Saunders, 1975.

Vol. 6 Summer, 2000 – Summer Sampling Programs

by Todd Swenson

During the summer of 2000, Saskatchewan Environment and Resource Management and the BSLWSA will be conducting a rigorous monitoring program on Big Shell Lake.

Monitoring for this summer will consist of the regular surface water quality monitoring program, and a special sediment sampling program.

Surface Water Quality Monitoring

This program was initiated in 1997, and has continued annually since that time. Water quality measurements are taken on both physical and chemical parameters. Physical parameters include dissolved oxygen concentration, temperature, pH, turbidity, and conductivity. Chemical parameters include various types of nitrogen analyses, phosphorous, total dissolved solids, and heavy metals.

Surface water samples will be taken during the summer from the 3 locations shown in the following figure.

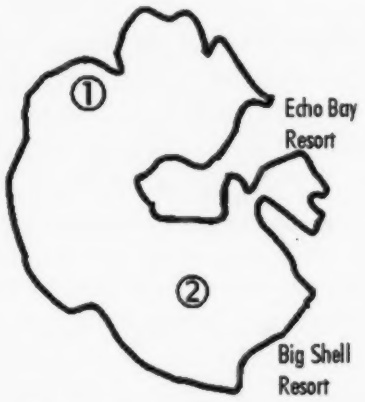
In addition to these samples, runoff samples will be collected from various locations when conditions allow.

Sediment Monitoring

A special sampling of Big Shell Lake's sediments was done in the week of June 19th. The sampling involved collecting two large diameter cores, from the locations shown in following figure.

These cores, once collected were sectioned into 1 centimetre slices, and each slice documented and immediately refrigerated. This provided a number of samples from each location, which will be sent to the University of Regina for a special analysis. The University of Regina will perform two separate analyses on the sediment slices.

First, the age of each layer of sediments will be determined by using lead ^{210} dating, which is similar to how fossils are aged using Carbon^{14}, except that lead^{210} has a shorter half-life, and is therefore a more reliable measure of the age of more recently deposited sediments.



SedimentSampling Stations, Big Shell Lake

The second analysis to be performed will be to determine the level of nutrients that were likely present in the lake when each layer of sediment was deposited. This will be done by testing each slice of sediment for algal pigments. Since the sediments of a lake are partly made up of dead and decaying algae, the total amount and types of algal pigments present in a layer of sediment is directly related to the amount of nutrients that were present in the water column at the time the sediments were deposited.

The final outcome of all of this work should supply the BSLWSA and SERM with a clear picture of when excess nutrient loading to Big Shell Lake began.

It is anticipated that results of the sediment sampling program will be finalized in a report by December 2000.

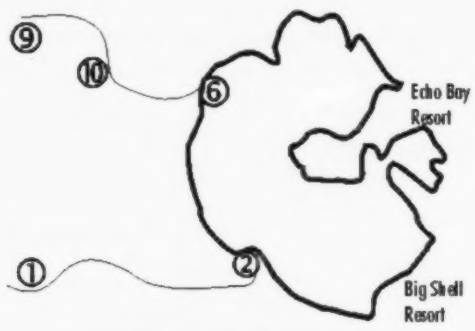
Results of the surface water quality monitoring will be provided to the BSLWSA in an annual surface water quality monitoring report by SERM.

Vol. 7 Fall 2000 – Water Quality Report

by Todd Swenson

Stream Quality

For the first time in several years, Big Shell Lake had significant streamflow into the lake. Stream water quality sampling for 2000 was mainly done in the spring.



Stream Sampling Stations, Big Shell Lake

Samples were taken from five locations on the two major inflow streams; three locations on the stream which flows into the northwest shore of the lake, and two locations on the southwest stream. Results from the northwest stream show increasing contamination between location 9 and location 10. This water then passes through a marsh prior to entering Big Shell Lake. This marsh removes some of the contaminants, but the increase in levels of nitrogen, phosphorous and especially animal waste-related contaminants at location 6 compared to location 9 is significant.

Lake Quality

All monitoring results for lake water quality have not yet been received and will be interpreted and reported in another newsletter.

Lake levels increased significantly this summer, but no apparent dilution of the nutrients in the water column took place. This may be evidence that the runoff, ground water, and other sources of recharge to Big Shell Lake continue to feed nutrients to the lake.

More information on this years' water quality monitoring, will be available for the Winter 2001 report.

Vol. 8 Summer 2001 – Big Shell Lake Water Quality Report 2000

Todd Swenson

Data that was collected during the spring and summer of 2000, plus samples taken during January 2001 will be used in the following sections to describe the general water quality of Big Shell Lake in terms of the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*.

Stream Water Quality

Water samples were collected from 5 separate locations along streams and creeks flowing into Big Shell Lake during runoff events in 2000. Samples were also taken from 1 location prior to leaving the lake. No samples of outflow waters were taken. Basic water chemistry analyses were done on the stream samples.

Nutrients

Nitrogen and Phosphorous

Samples were analysed for Ammonia as nitrogen and Total Kjeldahl Nitrogen. Samples from locations 6 and 10 showed elevated concentrations of both forms of nitrogen, indicating some effects of land use on that water body.

Similarly, locations 6 and 10 showed elevated concentrations of phosphorous.

General Chemistry

All samples from stream locations were well below *Saskatchewan Surface Water Quality Objectives* for the protection of aquatic life and wildlife, as they apply to general chemical parameters, although the unnamed creek flowing into the lake on the southwest corner had slightly elevated iron concentrations (ranging from 0.26 to 0.38 mg/L at sites 4 and 8, respectively.) These levels remain below the SSWQO for iron (1.0 mg/L).

Lake Water Quality

Dissolved Oxygen

Dissolved oxygen is a fundamental requirement for aquatic life, without it there would be no fish or plants. Dissolved oxygen profiles were conducted through the ice on January 24, 2001 to identify possible oxygen deficit. *Saskatchewan Surface Water Quality Objectives* recommend "a minimum concentration of 5 milligrams per litre, in order to preserve water quality for the protection of aquatic life."

The data on dissolved oxygen profiles from two of the three stations showed dissolved oxygen levels less than 5 mg/L at depth. Station 1, had dissolved oxygen levels ranging from 9.75 mg/L at surface, to 6.5 mg/L at 6 metres. Dissolved oxygen concentrations fell to less than 1 mg/L at 11.5 metres. Station 2 showed very low dissolved oxygen levels throughout the entire water column, with only 3.25 mg/L at surface, and 0.43 mg/l at 4 metres below surface.

Water Sampling Stations, Big Shell Lake

Station 3 has more oxygen in the water column, with dissolved oxygen concentrations ranging from 11 mg/L at surface to 8 mg/L at 6 metres, which was approximately 2 metres above the bottom at our sampling location.

Several different chemical reactions take place within the sediments when levels of dissolved oxygen fall below 1 mg/L. Phosphorous release from sediments can occur because of these chemical reactions. The decomposition of organic matter and an association with sediment bound iron are two reactions that can cause phosphorous release. If lake stratification occurs due to wind, phosphorous is released from the lower portions of the lake into the overlying waters. Manganese and iron are also released from the sediments during these anoxic periods which can cause odour problems.

Specific Conductivity

The specific conductivity in water is closely related to the salinity in water and is usually expressed as a measure of electrical conductivity. Salinity of the water is most important with regards to various agricultural uses such as irrigation or livestock watering. Specific conductivity values for Big Shell Lake during January 2001 ranged from 445 uS/cm to 534 uS/cm. These values indicate relatively low salinity and good chemical quality. These salinity levels would not affect any of the expected uses of the water in Big Shell Lake.

Nutrients

Surface Water Quality Objectives state that "phosphorous or nitrogen or other nutrient concentrations should not be altered from natural levels by discharges of effluents such that nuisance growths of aquatic weeds or algae results."

Total Phosphorous

Total phosphorous is the total sum of organic and inorganic phosphorous. In most lakes, the amount of algae in the water is a function of the amount of phosphorous. This is because phosphorous is in the shortest supply of all the nutrients that lake plants need for growth. When it runs out, the algal population can no longer increase and when the algae dies off the phosphorous is again returned to the water and sediments to be reused. A larger phosphorous supply usually results in more algae and aquatic weed growth.

Total Phosphorous levels ranged from 0.05 milligrams per litre (mg/L), to 0.13 mg/L. These concentrations are somewhat lower than those reported in 1998, although seasonal variations between summer and winter sampling could account for the change.

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN) is measured using a Kjeldahl digestion which calculates the amount of nitrogen which is readily converted through biological processes to ammonia, which is the primary source for nitrogen in aquatic plant growth. TKN levels ranged from 0.88 mg/L at Station 3 in the Winter, to 5.2 mg/L at station 3 in the summer. These concentrations are somewhat higher than values reported previously, though the cause and significance of this increase is unknown.

Special Intensive Sampling

Special intensive sampling was done in January, whereby three replicate samples were taken from three separate strata of the water column (sub-surface, mid-column and near-bottom), at the three usual lake sampling locations (Locations 1, 2, and 3). This type of sampling was performed to determine with more accuracy the concentrations of various parameters, as well

as compare any noticeable correlation between concentration and depth. These samples were taken in conjunction with the Dissolved Oxygen profiles discussed earlier.

On the whole, replicate samples showed good comparability, with no values being significantly different in each parameter.

Irene Giesbrecht and Todd Swenson taking water samples through the ice

Station 1 - Big Shell Point

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 1 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This location had Phosphorous and Nitrogen levels intermediate to the other locations.

Station 2 - Echo Bay

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 2 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This station had the highest concentrations of Phosphorous and Nitrogen, which is likely a reflection of Echo Bay's limited depth and increased plant production during summer months. The natural degradation of plant material during winter will give rise to increased nutrient concentrations in the water column.

Station 3 - Main Lake, Near Campground

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 3 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This station had the lowest concentrations of Nitrogen and Phosphorous.

Conclusion

The water quality study that was conducted for 2000 at Big Shell Lake indicates that there remains to be high levels of nutrients. These sources stem from various external and internal sources. The mass amounts of submergent and emergent vegetation and algae are the result of nutrient loading. The relative fertility of the lake can be classified as mainly eutrophic (highly productive) for this sampling period.

Works Cited

Saskatchewan. Environmental P Protection Branch. *Municipal Drinking Water Guidelines*. Regina: Saskatchewan Environment and Resource Management, 1995.

Saskatchewan. Environmental Protection Branch. *Surface Water Quality Objectives*. Regina: Saskatchewan Environment and Resource Management, 1997.

as compare any noticeable correlation between concentration and depth. These samples were taken in conjunction with the Dissolved Oxygen profiles discussed earlier.

On the whole, replicate samples showed good comparability, with no values being significantly different in each parameter.

Irene Geisbrecht and Todd Swenson taking water samples through the ice.

Station 1 - Big Shell Point

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 1 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This location had Phosphorous and Nitrogen levels intermediate to the other locations.

Station 2 - Echo Bay

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 2 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This station had the highest concentrations of Phosphorous and Nitrogen, which is likely a reflection of Echo Bay's limited depth and increased plant production during summer months. The natural degradation of plant material during winter will give rise to increased nutrient concentrations in the water column.

Station 3 - Main Lake, Near Campground

There was no significant difference between surface, mid-column and near surface chemical parameter concentrations.

Station 3 water quality was well below both the *Saskatchewan Surface Water Quality Objectives* and *Municipal Drinking Water Guidelines*. This station had the lowest concentrations of Nitrogen and Phosphorous.

Conclusion

The water quality study that was conducted for 2000 at Big Shell Lake indicates that there remains to be high levels of nutrients. These sources stem from various external and internal sources. The mass amounts of submergent and emergent vegetation and algae are the result of nutrient loading. The relative fertility of the lake can be classified as mainly eutrophic (highly productive) for this sampling period.

Works Cited

Saskatchewan. Environmental P Protection Branch. *Municipal Drinking Water Guidelines*. Regina: Saskatchewan Environment and Resource Management, 1995.

Saskatchewan. Environmental Protection Branch. *Surface Water Quality Objectives*. Regina: Saskatchewan Environment and Resource Management, 1997.

Vol 8 Summer 2001 – Historical Trends in the Production and Water Quality of Big Shell Lake

James A. Rusak and Peter R. Leavitt

Conclusions

Analysis of fossil pigments suggests that there has been an increase in overall lake production since the 1970s. However, modern production values are still within the natural range of values observed in Big Shell Lake since 1850. The exact timing of this production increase (1950 vs. 1980) is difficult to determine because of the transient increase in production during the 1960s. Increased use of inorganic fertilizers is one of the factors that could be investigated further as a potential cause of increased production.

The recent increase in algal production is due to all groups of algae, including potentially toxic, N-fixing cyanobacteria. Because such algae are prone to form highly visible surface blooms, this group may be contributing to the public perception of recently reduced water quality. However, it is worth noting that biomass increases in cyanobacteria have been in direct proportion to those of other, non-toxic algal groups. Therefore lake management should focus on regulation of factors that control overall algal production, not just blue-green forms.

SedimentSampling Stations, Big Shell Lake

The similarity of historical reconstructions among cores suggests that fossil pigments and isotopes are recording lake-wide trends in production and water quality. Differences in the degree of change among cores suggests that Site 1 is either more heavily impacted, or that it has depositional characteristics that tend to record historical events slightly differently than does Site 2.

Analysis of past water quality in Echo Bay

by Dr. Peter R. Leavitt

Conclusions

Water quality has not declined significantly during the past 50 years, relative to levels recorded since ~1750 AD. We believe that Echo Bay is naturally productive.

Large blooms of colonial cyanobacteria have been present in the lake throughout the past ~250 years. There is little evidence that the intensity of these blooms has increased recently.

Neither land clearance (forestry, agriculture) nor cottaging appears to have substantially degraded water quality in Echo Bay. The embayment is naturally productive, likely as a consequence of its shallow depth and high baseline nutrient inputs.

Nutrient cycling (carbon and nitrogen) appears to have remained stable throughout the last 2.5 centuries. Analysis of stable isotopes does reveal some recent changes in N cycling, but the magnitude and direction of these changes are similar to those which have occurred in the past.

Sediments deposited during the last 25 years suggest that algal exposure to light, specifically UV radiation, has increased since ~1975. Such an increase could reflect a recent increase in water clarity, or a decline in the depth of the embayment. Regardless of the mechanism, increased light penetration is expected to increase the availability of benthic habitat available for growth of submerged aquatic plants. Such an increase in habitat can lead to increased presence of weeds within the embayment.

Ground Water Reports

Private Well Testing

Vol. 3 Winter 1998/99 – Big Shell Lake Water Quality Summary 1998

by Brenda Thurston

The primary purpose of the water quality assessment on Big Shell Lake was to determine current lake water quality based on monitoring for 1998 and to determine possible external sources of nutrient loading.

Well sampling was conducted on August 3 and September 7, 1998 from randomly selected wells, surrounding the lake. The samples were tested for total coliform and Escherichia Coli (*E. coli*) on both dates. Nitrates were also tested on the samples taken on September 7, 1998.

Total coliforms are found in the environment and in the intestinal tract of warm-blooded animals and is used as an indicator of bacteriological quality of water. It is not necessarily an indication of the presence of fecal contamination. This is the most common test used for potable drinking water supplies for sewage contamination and is an indicator for inadequate disinfection of a water supply. *E. coli* is an organism that lives in the intestine of warm-blooded animals and is the best indicator for fecal contamination in a potable water supply. *Saskatchewan Municipal Drinking Water Guidelines* state that "The maximum concentration (MAC) for total coliforms is no organisms detectable per 100 mLs of sample."

On August 3, 1998, 60 wells were sampled. Results showed that 30 wells tested on that date were positive for total coliforms and 3 tested positive for *E. coli*. On September 7, 1998, 32 wells were tested. Most of the wells that were tested on this date had been tested previously and shown a positive result on the earlier sample date These results showed that 19 were positive for Total coliforms and 5 tested positive for *E. coli*. Nitrate results concluded that all wells are within the 45 mg/L range and are acceptable.

These results show that septic tank leakage is one of the sources of external nutrient loading. Sampling should be conducted again in 1999 for those wells that showed positive results, and measures should be taken to remedy this situation.

2001 Water Well Testing Summary

In 2001, 51 wells were tested. 2 wells were over the limit of 45 mg/L for nitrates and 11 wells tested positive for coliform bacteria with 2 wells showing contamination with *E. coli*.

The maximum acceptable concentration of nitrate in drinking water is **45 mg/L**. In excessive amounts, it contributes to the illness known as methemoglobinemia in infants. Sources of nitrate in water include decaying plant or animal material, agricultural fertilizers, manure, domestic sewage or geological formations containing soluble nitrogen compounds.

The presence of coliform organisms is an indication of contamination. The maximum acceptable concentration for total coliforms in drinking water is no colonies of bacteria detectable per 100mL of sample. Contamination by coliform bacteria can be from a variety of sources. Leaking or overflowing septic tanks are the most obvious culprits, but other sources may be such things as beaver ponds, livestock operations, etc. Contaminated wells should be shock chlorinated and then re-tested within two weeks. Chlorination only treats the symptoms, of course. Unless the source of the contamination can be determined and rectified, and if the well is to be used for drinking water, it will need to be monitored and treated on a regular basis and a disinfection system should be added to the treatment process.

Piezometers – Sewage Lagoon Study

Vol. 4 Fall 1999 - Sewage Lagoon Study

by Karen Benjaminson

PFRA, in cooperation with the BSLWSA and the Resort Villages of Big Shell and Echo Bay initiated a study of the two village lagoons early in 1999. A drilling program was carried out to install piezometers to measure ground water levels and to allow the collection of water samples for analysis in the area around the lagoons. A total of six test holes were drilled in the period January 27 to February 3, 1999, with three test holes being drilled at each site. The depths of the test holes varied from 4.5 to 11.2 metres. The location of the test holes was restricted by the landscape, particu-

larly at the Echo Bay site. The soils encountered include clays, silts, and sandy materials.

Initial readings taken in the piezometers indicate there is a ground water gradient towards the lake. Additional readings and possibly more piezometers may be required to properly evaluate the ground water flow around these sites.

The plan is to monitor the water quality at these piezometers on a seasonal basis. Initial sampling was done March 17, 1999 from the three piezometers at Echo Bay. The piezometers at the Resort Village of Big Shell could not be sampled as one was frozen, one had gone dry, and one drilling site had been abandoned after encountering rocks and difficulties with snow clearing to allow the rig access to the desired drilling location. Three piezometers at Echo Bay, and two at the Resort Village Big Shell were sampled June 9, 1999 and again July, 1999. Further sampling and data collection will take place in August, September, and October. Decisions then can be made about the future use of the sewage lagoons in consultation with the resort villages and other people and businesses in the community.

The Big Shell Lake Community Watershed Management Project, a four-year, $145,000 initiative is being funded by the Canada-Saskatchewan Agri-Food Innovation Fund. The project is being delivered by PFRA's North Battleford office in co-operation with the Big Shell Lake Watershed Stewardship Association, Saskatchewan Water Corporation, Saskatchewan Environment and Resource Management, and Saskatchewan Agriculture and Food.

Vol. 5 Winter 1999/00 – Sewage Lagoon Study

by Karen Benjaminson

In early 1999, PFRA, in co-operation with the BSLWSA and the Resort Villages of Big Shell and Echo Bay, launched a study of the two village lagoons.

A drilling program was carried out to install piezometers to measure ground water levels and to allow the collection of water samples for analysis in the area around the lagoons. The soils encountered include clays, silts, and sandy materials. Initial readings taken in the piezometers indicate there is a ground water gradient towards the lake. Water samples were tested for various forms of nitrogen, phosphorous, and bacteria.

Technical advisors of the BSLWSA – Len Sinclair of SERM, Don Dill of Sask Water, and Karen Benjaminson of PFRA – will be meeting in mid-winter 2000 to review the study data. Decisions concerning the future use of the sewage lagoons should be based on scientific analysis of a complete year of data. The ultimate decisions will be made by the Resort Villages.

The BSLWSA and its advisors will continue to collect and analyse the study data and advise on possible solutions and actions to safeguard the local environment. One goal of the study is to determine whether the sewage lagoons should continue to operate as they are. If the answer is no, technical advisors will formulate another course of action to determine how the sewage can best be managed.

Data has been collected since March 1999. Once the February sampling is complete, the full year of data will be analysed and reported again in *News of the Shed*, along with any progress made towards answering the above questions.

Water sampling costs (labour and lab analysis) for the study have been funded by the Agri-Food Innovation Fund (AFIF) – the government grant that helped to start the BSLWSA. PFRA's Geotechnical Service has covered costs associated with the piezometer installations.

Other Ground Water Data

A piezometer was also installed on Dave and Linda Caswell's land to monitor ground water quality in the vicinity of their livestock operation. The present data will be compared with future data as one way to monitor and evaluate any ground water quality changes that result from the recently constructed retention pond and cattle wintering site.

Vol. 6 Summer 2000 - Sewage Lagoon Study Update

by Karen Benjaminson

The conclusion of the sewage lagoon study is that both the Resort Village's of Big Shell and Echo Bay lagoons are not operating properly and corrective measures need to be undertaken. Effluent containing nutrients and bacteria is seeping from the lagoons into the underlying ground water. As a result, both villages are investigating methods to manage sewage disposal.

Current locations of the existing lagoons are not optimal because of the underlying geology and the close proximity to the lake. Scientists speculate both

sewage lagoons are located in areas of glacial deposited coarse material. Coarse glacial formations allow unconfined ground water flow. The ground water's movement cannot be accurately determined by the study unless more piezometers are drilled and monitored, and this is costly.

Construction of the Resort Village of Big Shell's lagoon was approved by Sask Water under the condition that a 0.6 metre thick compacted clay liner be installed. Once the lining was in place and confirmed, approvals to begin operating the lagoon would have been issued, but the lining was never confirmed.

The Resort Village of Echo Bay dump site was never submitted to Sask Water for approval. This location is situated in what appears to be a natural low area without a clay lining.

Four options these resort villages could consider include:

- Finding an appropriate site to build a new lagoon. This spot could be centrally located and used by the villages on Big Shell Lake and Iroquois Lake with costs shared by each user.
- Refurbish the existing lagoon in the Resort Village of Big Shell, and depending on its capacity, use it for Echo Bay's sewage disposal, while sharing the costs between both resorts.
- Spreading sewage effluent on agricultural land.
- A fourth option, to use the Town of Shell Lake sewage lagoon, is not possible because the Shell Lake lagoon cannot handle any more effluent than it currently receives.

Optimal geology for any type of sewage lagoon location is over geologic materials that contain high amounts of tight clay material with a low seepage rate, thus restricting ground water movement. According to Todd Swenson, SERM and Stephen Gibbard, PFRA, an ideal site would be a confined watershed. A confined watershed does not drain into any other watershed. The confined watershed would not be located at the top of a hill, avoiding ground water recharge. Other characteristics of suitable sewage lagoon sites include:

- soils and geology consisting of tighter tills and clays with a minimum of 10 meters of clay below the bottom of the sewage lagoon liner;
- an area where no other wells or aquifers are located within at least a mile of any people. Never site a lagoon in the same aquifer as a supply well;
- an all weather road so that the site is accessible for dumping all year.

Sask Water and SERM work together to approve the construction and operation of sewage lagoons in the province. Once a resort village applies to Sask Water for a new sewage lagoon, staff review the engineered plan and forward the application to SERM for clearance on the environmental, health and safety aspects of the project. Once all regulatory requirements are met, the proposed project may be approved for construction with conditions. If the project does not receive SERM's clearance or meet Sask Water's requirements, approval to construct is withheld. Once Sask Water issues an approval to begin operating a lagoon, SERM issues a Minister's Order, outlining the operational requirements and conditions.

The Resort Villages of Big Shell and Echo Bay have important sewage management decisions to make. The importance of protecting ground water quality should not be taken for granted. Appropriate sewage disposal will come at a cost - but the value of clean water is priceless.

Vol. 9 Fall 2001 – Constructed Wetlands

Wetlands are the filtering system of the natural world. Sediments settle out, microorganisms transform pollutants and water plants use up nutrients. With the considerable cost of building conventional wastewater treatment plants and lagoons, some municipalities are turning to constructed wetlands as an alternative.

The Resort Villages of Echo Bay, Big Shell Lake and Pebble Bay as well as the Hamlet of Pelican Cove are organizing and consulting with Golder Associates to implement a constructed wetland project for their effluent. The constructed wetlands will be designed to contain and treat effluent from holding tanks. A series of constructed ponds within a natural drainage area will be planted with hydrophilic or water tolerant plants. The water after passing through the wetlands can be used for irrigation and as an alternate watering supply for livestock.

The Town of Humboldt constructed the first artificial wetlands demonstration project in Canada in 1979. Since then, the concept has also been applied to the treatment of runoff from intensive feedlot operations.

Fish Studies

Vol. 3 Winter 1998/99 - Fish Study September 15, 1998 Big Shell Lake

by Gord Sedgewick

Big Shell Lake (714 ha) was stocked with 3.35 million walleye fry between 1946 and 1960. Northern Pike were the main gamefish species present at the time so stocking was conducted to diversify angling opportunities. However, only a sparse walleye population was established.

A three-year offshore stocking program was initiated in 1965 in another attempt to establish walleye. There were 500,000 walleye fry stocked annually in 1965, '67 and '68.

Follow-up test netting indicated good stocking success. An additional 500,000 walleye fry were stocked in 1971 and 300,000 in 1974. Test nets in 1975 indicated natural reproduction was occurring so no further stocking was required.

In 1979, test netting indicated a very good walleye population and a fair to moderate pike population. In 1983, test netting indicated a moderate pike population and a good walleye population though numbers had decreased from previous study in 1979.

In 1988, test nets indicated a good walleye population and a moderate pike population. The walleye population was being maintained by natural reproduction so no stocking was required. There was also a sparse population of angling size perch present in the lake in 1988.

In 1993, test nets indicated a good walleye population comprised of several year classes although the total catch was slightly down from the 1988 study. The pike population was up slightly, with several year classes indicating fair natural reproduction. No perch were captured in this test netting.

The 1998 study was conducted to update 1993 records on the fish populations. Once again the test nets indicate a very good walleye population, with the population being maintained by natural reproduction.

Vol. 7 Fall 2000– Summary of 2000 Test Netting

by John Weir

A fisheries study was conducted this past September to test the feasibility of using down haul trap nets (live capture) in Big Shell Lake and to assess the existing fish population. The numbers of walleye captured in 2000 were down considerably from the 1998 study. In 1998, 175 walleye were captured in 240 m of gill net. In 2000, only 38 walleye were captured using the two 2 m down-haul trap nets. Although there were several year classes present no walleye under 32 cm were captured. Pike numbers were also down considerably from the 1998 study. In 2000, 43 burbot were sampled as compared to 1 in 1998.

The difference in numbers of fish between the 1998 and the 2000 study is most likely due to the different type of sampling gear. However, evidence of a blue-green algae bloom that had recently occurred in the main lake basin is a concern.

Fisheries Biologists test netting on Big Shell Lake

Fisheries Report 2001-02

by John Weir

A fisheries study was conducted last summer on Big Shell Lake by Saskatchewan Environment's fisheries staff to determine the status of the walleye population. On May 9-12, 2001, a trap net was set near the inlet on the south west corner of Big Shell Lake. A total of 36 walleye, 65 northern pike, 5 burbot and 795 white suckers were captured.

Fish Studies

Vol. 3 Winter 1998/99 - Fish Study September 15, 1998 Big Shell Lake

by Gord Sedgewick

Big Shell Lake (714 ha) was stocked with 3.35 million walleye fry between 1946 and 1960. Northern Pike were the main gamefish species present at the time so stocking was conducted to diversify angling opportunities. However, only a sparse walleye population was established.

A three-year offshore stocking program was initiated in 1965 in another attempt to establish walleye. There were 500,000 walleye fry stocked annually in 1965, '67 and '68.

Follow-up test netting indicated good stocking success. An additional 500,000 walleye fry were stocked in 1971 and 300,000 in 1974. Test nets in 1975 indicated natural reproduction was occurring so no further stocking was required.

In 1979, test netting indicated a very good walleye population and a fair to moderate pike population. In 1983, test netting indicated a moderate pike population and a good walleye population though numbers had decreased from previous study in 1979.

In 1988, test nets indicated a good walleye population and a moderate pike population. The walleye population was being maintained by natural reproduction so no stocking was required. There was also a sparse population of angling size perch present in the lake in 1988.

In 1993, test nets indicated a good walleye population comprised of several year classes although the total catch was slightly down from the 1988 study. The pike population was up slightly, with several year classes indicating fair natural reproduction. No perch were captured in this test netting.

The 1998 study was conducted to update 1993 records on the fish populations. Once again the test nets indicate a very good walleye population, with the population being maintained by natural reproduction.

Vol. 7 Fall 2000– Summary of 2000 Test Netting

by John Weir

A fisheries study was conducted this past September to test the feasibility of using down haul trap nets (live capture) in Big Shell Lake and to assess the existing fish population. The numbers of walleye captured in 2000 were down considerably from the 1998 study. In 1998, 175 walleye were captured in 240 m of gill net. In 2000, only 33 walleye were captured using the two 2 m down-haul trap nets. Although there were several year classes present no walleye under 32 cm were captured. Pike numbers were also down considerably from the 1998 study. In 2000, 43 burbot were sampled as compared to 1 in 1998.

The difference in numbers of fish between the 1998 and the 2000 study is most likely due to the different type of sampling gear. However, evidence of a blue-green algae bloom that had recently occurred in the main lake basin is a concern.

Fisheries Biologists test netting on Big Shell Lake

Fisheries Report 2001-02

by John Weir

A fisheries study was conducted last summer on Big Shell Lake by Saskatchewan Environment's fisheries staff to determine the status of the walleye population. On May 9-12, 2001, a trap net was set near the inlet on the south west corner of Big Shell Lake. A total of 36 walleye, 65 northern pike, 5 burbot and 795 white suckers were captured.

There were several walleye year classes present in the sample indicating that natural reproduction is occurring in Big Shell Lake. We did not capture any young walleye in the one or two year old age group in our nets. The walleye ranged in size from 35 cm to over 70 cm in length. The pike population has increased in numbers from the previous study and the sample ranged from 40 cm to over 62 cm in length.

Overall the population of angling size walleye appear to be in good shape, however I am concerned over the absence of small immature walleye in our study. A follow up study in two years will be conducted to assess the status of the fish population in Big Shell Lake.

Caswell Riparian Area Project

Vol. 3 Winter 1998/99 – Riparian Area Management Pilot Project

by Karen Benjaminson

Purpose

The purpose of the project is to protect or enhance the water quality of Big Shell Lake by managing the runoff from corrals and a cattle winter feeding site.

What?

The project, with co-operators Linda and Dave Caswell, may involve the relocation of a winter feeding site and corrals and construction of dikes and waterways to prevent runoff from coming into contact with manure from the cattle operation. A clay-lined retention pond may also be constructed to contain runoff from the winter feeding site and corral area to prevent the transport of nutrients and other substances of the manure from reaching the lake of ground water. The retention pond will be designed so that the runoff evaporates by the end of the growing season.

Who and Where?

At a BSLWSA directors' meeting some time ago, the idea of demonstration projects to protect or enhance water quality was discussed. Linda Caswell spoke to me about her and Dave's cattle operation which is located on the south end of the wetland area adjacent to Big Shell Lake. In previous years, the Caswell's had tried several winter feeding sites to see if they could find one that would not drain into Big Shell Lake. The alternative sites still drained into the lake, so Don Dill, Sask Water, and I met with Linda to see the operation. Later I revisited the site with Ken McKnight, SAF Regional Engineer, to try to come up with a solution.

The area's topography is complex, so North Battleford PFRA staff carried out a topographic survey of the site. PFRA also did some soil testing to determine the feasibility of various options to control runoff. Several meetings were held with Linda to discuss options being considered to ensure they would fit with the way the Caswells manage their livestock operation. PFRA District Engineer, Elwood Scott, is now exploring various design options and costs for the project. The next step will be to meet with the Caswells, discuss the various options, and determine which plan is most suitable to them.

Monitoring

Recently, PFRA installed one observation well on the Caswell's land. Water samples will be taken from this well to determine the current water quality and measure any changes in water quality that result after this project.

Caswell alternate wintering site

Why?

Livestock excrement contains nutrients such as nitrogen and phosphorous, and bacteria such as Escherichia coli. These nutrients and bacteria are also present in human sewage and the excrement of various wildlife species. Runoff passing through areas with a build up of manure can transport these contaminants

Caswell Riparian Area Project

Vol. 3 Winter 1998/99 – Riparian Area Management Pilot Project

by Karen Benjaminson

Purpose

The purpose of the project is to protect or enhance the water quality of Big Shell Lake by managing the runoff from corrals and a cattle winter feeding site.

What?

The project, with co-operators Linda and Dave Caswell, may involve the relocation of a winter feeding site and corrals and construction of dikes and waterways to prevent runoff from coming into contact with manure from the cattle operation. A clay-lined retention pond may also be constructed to contain runoff from the winter feeding site and corral area to prevent the transport of nutrients and other substances of the manure from reaching the lake of ground water. The retention pond will be designed so that the runoff evaporates by the end of the growing season.

Who and Where?

At a BSLWSA directors' meeting some time ago, the idea of demonstration projects to protect or enhance water quality was discussed. Linda Caswell spoke to me about her and Dave's cattle operation which is located on the south end of the wetland area adjacent to Big Shell Lake. In previous years, the Caswell's had tried several winter feeding sites to see if they could find one that would not drain into Big Shell Lake. The alternative sites still drained into the lake, so Don Dill, Sask Water, and I met with Linda to see the operation. Later I revisited the site with Ken McKnight, SAF Regional Engineer, to try to come up with a solution.

The area's topography is complex, so North Battleford PFRA staff carried out a topographic survey of the site. PFRA also did some soil testing to determine the feasibility of various options to control runoff. Several meetings were held with Linda to discuss options being considered to ensure they would fit with the way the Caswells manage their livestock operation. PFRA District Engineer, Elwood Scott, is now exploring various design options and costs for the project. The next step will be to meet with the Caswells, discuss the various options, and determine which plan is most suitable to them.

Monitoring

Recently, PFRA installed one observation well on the Caswell's land. Water samples will be taken from this well to determine the current water quality and measure any changes in water quality that result after this project.

Caswell alternate wintering site

Why?

Livestock excrement contains nutrients such as nitrogen and phosphorous, and bacteria such as Escherichia coli. These nutrients and bacteria are also present in human sewage and the excrement of various wildlife species. Runoff passing through areas with a build up of manure can transport these contaminants

downstream. Nutrients can contribute to algae blooms and bacteria can contaminate water.

Currently, the runoff from the corrals and winter feeding sites flows down to two low areas on the Caswell's land. In instances of high runoff, some of the surface water drains through a culvert and into the wetland area on the sound end of Big Shell Lake. When runoff is low, most of the surface water collects in low areas and eventually percolates down through the soil profile. No one knows the amount of nutrients or other substances that are in the runoff water.

We do, however, know that wetlands are a natural environmental buffer. The vegetation filters out and utilizes the nutrients, and purifies the water. Water that percolates through the soil profile is also purified to some extent, as soil acts as a biological filter.

The net impact of the Caswell's livestock operation on water quality is not known. However, every small impact on water quality within a watershed adds up, so it is prudent to make improvements where possible to protect water quality{ for future generations.

Brewer Alternate Water Supply

Vol. 5 Winter 1999/00 - Dugout for Alternate Water Supply Recently Constructed

by Karen Benjaminson

During summer and fall, Lloyd and Brent Brewer's cattle utilize pasture land along the west side of Big Shell Lake. The cattle drink from the sloughs on the pasture until late summer or early fall, when the sloughs usually dry up. Once water on the pasture becomes unavailable, the cattle wander down to the lakeshore to drink.

In December 1999, a dugout was constructed on the pasture to provide a more secure water source for the cattle so that they will no longer need to water at the lakeshore. Because the pasture land is quite hummocky, there was no ideal location for a dugout. All potential locations have small drainage areas, meaning they would probably not completely fill the dugout from spring runoff.

The nature of the landscape made it necessary to trench from the dugout, which was constructed in an existing slough area, to several other sloughs on the pasture. The water that will flow from these three other sloughs during spring runoff will contribute water to the dugout, in addition to that contributed from the dugout's own drainage area.

The previous impact of cattle watering along the lakeshore was minimal, however, it is beneficial to eliminate as many impacts as possible to protect water quality. In any watershed, it is typically the cumulative effects of many sources of water degradation that cause problems, so elimination or reduction of as many sources of pollution as possible is advisable.

Vol. 7 Fall 2000 – Big Shell Lake Water Quality Project Complete

by Karen Benjaminson

A project designed to help protect the water quality of Big Shell Lake is now complete.

Located on Lloyd and Brent Brewer's pasture on the west side of Big Shell Lake, the project developed is an alternative water supply for cattle in the pasture upland area. As a result of the new supply, cattle will no longer water at the lakeshore.

In addition to helping protect the water quality of the lake, the project demonstrates some of the latest water quality technology for improved livestock weight gains. More on this topic is discussed in the accompanying *PFRA Projects Highlighted At WBDC* (Western Beef Development Centre) *Field Day* article.

The major components of the water supply project included:

- dugout and trenching,
- solar panel and battery,
- diaphragm pump,
- "The Trough",
- associated water lines, wiring, and hookups.

The initial set up of the solar system and trough was completed in July, 2000.

The main solar system components are: a 64 watt shatter-proof solar panel, panel stand, pole, a regulator with low volt disconnect, one foot valve, one filter, one float switch, one group 27, 75 amp/hr battery, battery box, wiring package, and poly hose.

The trough is made from a seven foot, twelve to eighteen inch thick, mining tire with a cement plug and steel casing in the middle that protects the trough float mechanism. The tire had a leak, so Brent drained it and repaired it with silicone. The system has been operating perfectly since then. Brent and Lloyd also hauled in some sand and gravel which was spread around the trough to provide good footing for the cat-

tle. In addition, they fenced around the dugout to protect its water quality.

The dugout filled to about 2/3 capacity following spring 2000 runoff. PFRA monitored dugout water levels during May and June and determined that it will hold water despite some sand encountered during construction. PFRA then proceeded to plan and purchase the watering system with Brent's input.

Brewer alternate watering supply

Brent and PFRA staff inspected the lakeshore during a July 2000 visit to the project site. The inspection confirmed that cattle had not been to the lakeshore this summer.

The previous impact of cattle watering along the lakeshore had been minimal, however, to protect water quality it is always beneficial to eliminate as many impacts as possible. In any watershed, it is typically the cumulative effects of many sources of water degradation that cause problems. Elimination or reduction of as many sources of pollution as possible is advisable.

A special thanks to Brent, Wendy, and Lloyd Brewer for their cooperation in the planning, implementation, and maintenance of this project.

Vol. 9 Fall 2001 – Brewer's Alternative Watering Site Project Update

by Charles Salisbury and Garet Cormin

The project was designed to water cattle in a pasture owned by the Brewer family, located on the west side of Big Shell Lake. In wet years, cattle could water at a number of shallow sloughs located throughout the pasture, making cattle traffic to the lake generally light. In dry years, however, the sloughs dry up, leaving Big Shell Lake as the only water source. Cattle traffic to the lake would therefore be high during dry spells. Cattle could potentially water twice a day, or more, depending on the warmth of the weather.

A dugout (a man-made excavation in the ground, designed to trap and hold snowmelt and rain runoff) and trenching to divert runoff were constructed during the winter of 1999/2000. The dugout was fenced to keep livestock out. This is done to enhance water quality and facilitate treatments if conditions warrant it. A summer solar water-pumping system and large trough were installed. A heavy rain in the late summer of 2000 filled the dugout. Little or no runoff occurred in the spring of 2001.

After two seasons of use, these observations were made:

- Cattle traffic at the lake is down considerably.
- There was no noticeable difference in weight gains, though an extensive study would be needed to make any claim.
- There was no noticeable difference in grazing distribution. The pasture was grazed the same as before the project, though this is a dry year and the pasture was well utilized.
- In the summer of 2001, cattle from another pasture broke the fence and entered. These cattle drank the water, and as a result of the increased pumping demand, the battery was drawn down. In effect, the system failed for several days. It should be noted that the Brewer solar system is designed for a certain amount of cattle (capacity – one cow/calf pair can drink up to 20 Imperial gallons per day). More demand takes more power and this will drain the battery.
- The Brewers check the system and cattle at least twice a week, which is an increase in labour costs.

We have received several questions about cattle access to the lake and the suggestion that the lake should be fenced off completely. There are pros and cons for eliminating access to water bodies.

The pros include:

- Reduction of impacts from cattle along that side of the lake.
- Cattle will prefer to drink from a trough rather than wade into a water source, assuming water of comparable quality. This may contribute to im-

tle. In addition, they fenced around the dugout to protect its water quality.

The dugout filled to about 2/3 capacity following spring 2000 runoff. PFRA monitored dugout water levels during May and June and determined that it will hold water despite some sand encountered during construction. PFRA then proceeded to plan and purchase the watering system with Brent's input.

Brewer alternate watering supply

Brent and PFRA staff inspected the lakeshore during a July 2000 visit to the project site. The inspection confirmed that cattle had not been to the lakeshore this summer.

The previous impact of cattle watering along the lakeshore had been minimal, however, to protect water quality it is always beneficial to eliminate as many impacts as possible. In any watershed, it is typically the cumulative effects of many sources of water degradation that cause problems. Elimination or reduction of as many sources of pollution as possible is advisable.

A special thanks to Brent, Wendy, and Lloyd Brewer for their cooperation in the planning, implementation, and maintenance of this project.

Vol. 9 Fall 2001 – Brewer's Alternative Watering Site Project Update

by Charles Salisbury and Caret Cormin

The project was designed to water cattle in a pasture owned by the Brewer family, located on the west side of Big Shell Lake. In wet years, cattle could water at a number of shallow sloughs located throughout the pasture, making cattle traffic to the lake generally light. In dry years, however, the sloughs dry up, leaving Big Shell Lake as the only water source. Cattle traffic to the lake would therefore be high during dry spells. Cattle could potentially water twice a day, or more, depending on the warmth of the weather.

A dugout (a man-made excavation in the ground, designed to trap and hold snowmelt and rain runoff) and trenching to divert runoff were constructed during the winter of 1999-2000. The dugout was fenced to keep livestock out. This is done to enhance water quality and facilitate treatments if conditions warrant it. A summer solar water-pumping system and large trough were installed. A heavy rain in the late summer of 2000 filled the dugout. Little or no runoff occurred in the spring of 2001.

After two seasons of use, these observations were made:

- Cattle traffic at the lake is down considerably.
- There was no noticeable difference in weight gains, though an extensive study would be needed to make any claim.
- There was no noticeable difference in grazing distribution. The pasture was grazed the same as before the project, though this is a dry year and the pasture was well utilized.
- In the summer of 2001, cattle from another pasture broke the fence and entered. These cattle drank the water, and as a result of the increased pumping demand, the battery was drawn down. In effect, the system failed for several days. It should be noted that the Brewer solar system is designed for a certain amount of cattle (capacity – one cow-calf pair can drink up to 20 Imperial gallons per day). More demand takes more power and this will drain the battery.
- The Brewers check the system and cattle at least twice a week, which is an increase in labour costs.

We have received several questions about cattle access to the lake and the suggestion that the lake should be fenced off completely. There are pros and cons for eliminating access to water bodies.

The pros include:

- Reduction of impacts from cattle along that side of the lake.
- Cattle will prefer to drink from a trough rather than wade into a water source, assuming water of comparable quality. This may contribute to im-

proved animal health and performance (weight gain).

The cons include:

- Eliminating a source of water may decrease utilization of the pasture by livestock.
- As pastures are not attended to on a regular basis, watering systems can fail, making cattle susceptible to death if water is not available. This represents a financial loss to the farmer and is a concern from the viewpoint of humane treatment of animals.
- There is also a direct cost of fencing off the lake, as well as putting in and maintaining additional watering systems, as opposed to granting cattle free access to sloughs, streams or lakes.

What we have in this situation can be considered a good compromise. In this, a dry year, cattle have fewer watering options as sloughs dry up. Observations show that cattle are drinking from the trough, and that cattle visits to the lake are down. If the alternative supply was not provided, they would be watering at the lake daily.

During the period that the battery was drawn down, the cattle had to use the lake. Once the system returned to normal, they returned to using the dugout. In the end, the alternative supply has reduced livestock impact on the lake and the landowner has a watering system that helps to maintain his herd, and should improve pasture utilization in the process.

Palendat Alternate Water Supply

Vol. 8 Summer 2001 – Fencing and Alternate Water Supply Project on Big Stone Creek

by Charles Salisbury and Garet Cormin

The purpose of this project is to protect the area's water quality by preventing livestock from entering Big Stone Creek. In order to keep the animals out of the water, landowners will require an alternate water supply.

During a field visit on April 4, 2001, PFRA staff met with landowner Jim Palendat to assess his land and explore alternative watering options for his herd. After evaluating several watering choices, the group decided his best and most economical option was to develop a new well. The group recommended constructing this well approximately 400 feet from Big Stone Creek, neighbouring an existing wintering site. Staff also determined that the existing well at the farm yard site could not sufficiently meet the farm's domestic needs along with those of the livestock herd. Once complete, an estimated 500 ewes (summer) and 60 sows (summer and winter) will be watered by the project.

Alternate water supply on Palendat farm

Based on a review of Palendat's existing wells and ground water information in the area, PFRA staff were able to determine that the new well should be roughly 50 feet deep. Before work can begin, test holes must be drilled to confirm the ground water supply. The cost of drilling test holes is $6 per foot. Staff are estimating that four test holes will be required to properly test the site at a total cost of $1,200.00. Once the water supply is confirmed, a large diameter well - with a 30-inch casing - made of fibreglass will be installed. The calculated cost to install the well is $5,000.00. In addition, a solar energy power source will be installed to keep the pump fully operational. The cost of a solar powered pumping system and watering trough is estimated to be $4,000.00. Fortunately, only one trough will be required as a cross fence will separate the trough, allowing sheep to water from one side and sows on the other. Fencing the animals from the creek will require 500 to 600 feet of page wire and approximately 50 fence posts, totalling $400.00. The total estimated cost for this entire project is $10,600.00. The Palendats will be in charge of building the fence, while maintaining the well and supply system.

The project is the fourth in a series of remedial measures carried out on agricultural lands for the purpose of improving water quality within the Big Shell

proved animal health and performance (weight gain).

The cons include:

- Eliminating a source of water may decrease utilization of the pasture by livestock.
- As pastures are not attended to on a regular basis, watering systems can fail, making cattle susceptible to death if water is not available. This represents a financial loss to the farmer and is a concern from the viewpoint of humane treatment of animals.
- There is also a direct cost of fencing off the lake, as well as putting in and maintaining additional watering systems, as opposed to granting cattle free access to sloughs, streams or lakes.

What we have in this situation can be considered a good compromise. In this, a dry year, cattle have fewer watering options as sloughs dry up. Observations show that cattle are drinking from the trough, and that cattle visits to the lake are down. If the alternative supply was not provided, they would be watering at the lake daily.

During the period that the battery was drawn down, the cattle had to use the lake. Once the system returned to normal, they returned to using the dugout. In the end, the alternative supply has reduced livestock impact on the lake and the landowner has a watering system that helps to maintain his herd, and should improve pasture utilization in the process.

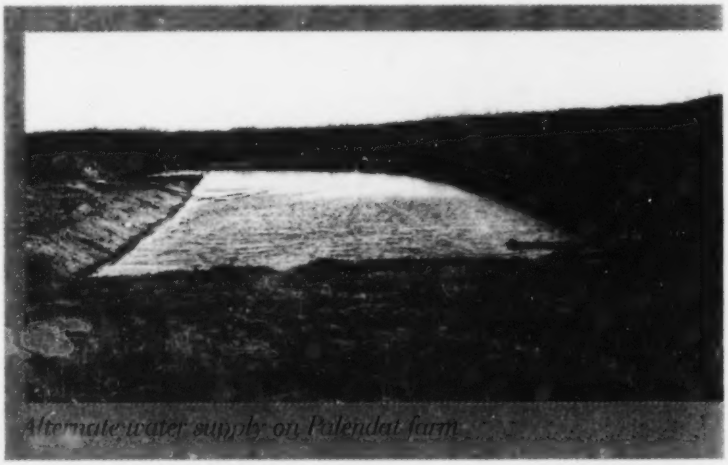
Palendat Alternate Water Supply

Vol. 8 Summer 2001 – Fencing and Alternate Water Supply Project on Big Stone Creek

by Charles Salisbury and Garet Cormin

The purpose of this project is to protect the area's water quality by preventing livestock from entering Big Stone Creek. In order to keep the animals out of the water, landowners will require an alternate water supply.

During a field visit on April 4, 2001, PFRA staff met with landowner Jim Palendat to assess his land and explore alternative watering options for his herd. After evaluating several watering choices, the group decided his best and most economical option was to develop a new well. The group recommended constructing this well approximately 400 feet from Big Stone Creek, neighbouring an existing wintering site. Staff also determined that the existing well at the farm yard site could not sufficiently meet the farm's domestic needs along with those of the livestock herd. Once complete, an estimated 500 ewes (summer) and 60 sows (summer and winter) will be watered by the project.



Alternate water supply on Palendat farm

Based on a review of Palendat's existing wells and ground water information in the area, PFRA staff were able to determine that the new well should be roughly 50 feet deep. Before work can begin, test holes must be drilled to confirm the ground water supply. The cost of drilling test holes is $6 per foot. Staff are estimating that four test holes will be required to properly test the site at a total cost of $1,200.00. Once the water supply is confirmed, a large diameter well - with a 30-inch casing - made of fibreglass will be installed. The calculated cost to install the well is $5,000.00. In addition, a solar energy power source will be installed to keep the pump fully operational. The cost of a solar powered pumping system and watering trough is estimated to be $4,000.00. Fortunately, only one trough will be required as a cross fence will separate the trough, allowing sheep to water from one side and sows on the other. Fencing the animals from the creek will require 500 to 600 feet of page wire and approximately 50 fence posts, totalling $400.00. The total estimated cost for this entire project is $10,600.00. The Palendats will be in charge of building the fence, while maintaining the well and supply system.

The project is the fourth in a series of remedial measures carried out on agricultural lands for the purpose of improving water quality within the Big Shell

Lake watershed. Funding for this project is being provided under the Canada Saskatchewan Agri-Food Innovation Fund (AFIF).

Vol. 9 Fall 2001 – Palendat Project Update

by Charles Salisbury and Garet Cormin

Finding suitable water for the alternative watering site project at Jim Palendat's farm has proven to be a challenge. The site is located approximately 2 miles west of Big Shell Lake on the southwest quarter of Section 2, Township 49, Range 9, W 3rd. To date, we have pump tested existing wells, conducted a ground water evaluation with the assistance of a PFRA hydro-geologist, carried out a GPS survey to establish elevations of existing sloughs, creeks and wells, and test drilled for water. We even had the driller dowsing for water. Despite these efforts, we've had no luck in finding a shallow ground water aquifer.

It was suggested by some in the community that livestock use the slough, located southwest of Jim's yard site, for watering, even though water quality in the slough can be very poor due to outbreaks of blue-green algae. With the large volume of water in the slough, treatment is not feasible. For this reason, the slough is not recommended as a source for livestock watering. A smaller volume of water, such as a dugout, would be more economical to treat.

The slough also presents a proximity problem. Supplying water to a pasture improves grazing distribution, but in this case, the existing slough is a long distance from the east and north pastures.

Due to these findings and budget constraints, it was decided a dugout would be the best choice. A solar-powered pumping system will be used for summer livestock watering, and a winterizing of the system will allow Jim to use the dugout through the winter.

Because the topography of the pasture has a limited drainage area and will not fill the dugout, the water was pumped from a slough to the dugout. This water will be tested and treated as required. An alternative source would be the creek, but pumping would have to take place during the spring melt and access may be a problem. The creek only runs during spring runoff and high rainfall events. Generally, only a few pools and beaver ponds contain water during the summer. Stagnant water pools in the creek can have the same water quality problems as sloughs. It should be noted that the creek will be fenced off from livestock in this case.

Construction of the dugout with a wet well and intake lines is now complete. A wet well is made of fibreglass cribbing and placed beside the dugout, and is used to provide access to water year round. Inlet water lines connect the dugout to the wet well, with the water pump located in the wet well. The dugout will also be fenced off to keep livestock out.

As the Palendats live on the quarter section that has the dugout, they will be able to check the watering system on a daily basis, to ensure that livestock needs are met.

In searching for a suitable water supply, we have gone through several stages of assessment as we examined our options. This would be a similar process that farmers and ranchers go through when making a decision. The obvious question is, "where is the water, and how do you access it?" But related questions concern issues such as water quality, cost of development, and the benefits and limitations of the development options. In this case, options were limited by the availability of water and a fixed budget. With an unlimited budget, it may have been possible to find water at a greater depth, but the cost of test drilling and the special pump and power system required to operate it may have been prohibitive.

This scenario illustrates why some people may be reluctant to change when they already have a known water supply – such as a creek or lake – one that costs very little to access, and allows for easy herd maintenance. Just the same, it is important to recognize and give credit to an individual willing to consider change, look at the options available, and then implement the change – despite the work involved, the extra cost, or any inconvenience.

The Palendats have expressed appreciation, as have all the project participants, for the technical and financial assistance provided by PFRA and BSLWSA in developing an alternative water supply, and I believe the community within the watershed will, in time, also come to understand and value the changes.

Big Stone Creek Grazing Project

Winter 2001/02

by Charles Salisbury

This project involves Lloyd and Brent Brewer, a farm family who rent seeded forage pasture on a square section of land located adjacent to the west side

of Big Shell Lake. The main focus of this project is to enhance pasture productivity, while protecting the riparian zone. Big Stone Creek flows through this land, which is owned by Lloyd and Ray Johnson.

The Brewers currently summer graze cattle on this section, with only a perimeter fence and no improved watering system. Lloyd and Ray Johnson have agreed to allow cross fencing with electric fence, and use solar water-pumping equipment to enhance pasture productivity. I am not advocating that cattle be completely removed from the riparian areas, but by managing the timing and duration of cattle impacts, these sites will be productive and have best management practices in place.

Ideally, a grazing system separates the pasture into manageable units that can accommodate full forage potential, allow enough recovery time for the forage, and help protect the riparian zones. One of the challenges with more fenced parcels is that water for the stock becomes limiting, and a source needs to be provided. During wet periods, these pastures have pothole sloughs where cattle water naturally. The problem is, during dry times these sloughs evaporate seasonally, leaving only the lake and two beaver ponds along the creek as the water sources. By providing a water-pumping system, the cattle can be watered in a different dry pasture, and protect the sensitive riparian areas. As the cattle get used to watering from the trough, they will prefer the trough located on dry ground over wading into soft-bottom waterholes. The livestock will have limited access to a water source as a backup to the solar pump in case of a watering-system failure. With average rainfall, the duration of grazing generally lasts from June 1 to Sept. 30, but may be shortened if drought conditions prevail.

The section is pastured by two herds, with 80 to 100 cow/calf pairs located north of the creek, and approximately 35 adult cattle south of the creek. The electric cross fence will divide the north area into three upland paddocks and one riparian paddock. The cattle will be rotated with one pass though these fields per season. The south area will be divided into two paddocks, with the open field as one, and the south bush pasture as the other. The Brewers have decided to repair an old fence that divided the field from the bush. The cattle will be grazed on the bush paddock first and then moved later in the summer to the open field and riparian creek area.

This grazing project, when complete, will divide the pasture into four fields north of the creek and two fields south of the creek.

Converting Ideas into Practices

by Charles Salisbury and Garet Cormin

In agriculture, new ideas can take time to gain widespread acceptance. Many factors play a role, including human nature, different learning tendencies, physical growing conditions, current practices, current market conditions and economic forecasts for what lies over the horizon.

Demonstrations have traditionally been used as a method of introducing new ideas, a process that involves testing the concept on a farm to see how it succeeds. PFRA works with co-operator farmers – those who contribute their land for demos – by providing follow-up assistance over the course of the project, and by making adjustments if necessary. Once the demo has been completed, it is important to step back and judge the results in terms of its success or failure, and to analyse the outcome.

This may seem like an unduly slow way to introduce a new idea, but there are two good reasons to use this approach – human nature and resistance to change. People are most comfortable doing things they already know, sticking to methods and routines that seem to be working. Making a change can also involve financial implications, time commitments, or risk to one's reputation in the community. There may also be other factors to consider, such as inconvenience as a result of the change, not understanding the advantage of the change, or not being in a position to make a change at the present time. Someone may have accepted your idea in principle, but not have the financial resources to make the necessary changes. There may also be some doubt that the change will produce the desired results. These factors must be taken into consideration when planning a project that introduces a new idea.

When proposing a change and designing a demonstration project, it is important to determine how much confidence there is in the feasibility of the idea. That is, have we seen it done before, and does the concept seem reasonable? The next step is to find a willing co-operator. When introducing a new idea, it must be conveyed to the farm partner that the concept being tested has merit and could work. In co-operation with the farmer, the demon-

stration project would usually be carried out in a public area, such as the farmer's field.

People who develop an understanding of an idea early on and are willing to try new ideas are referred to as innovators. It is important to provide support to the innovator in the form of technical knowledge, moral support, financial assistance, or all of the above.

Through this process, new ideas are explored, studied and analysed. Once the demo has been completed, the next step is to share the findings. While some local observers will have been watching and evaluating every phase of the demo – over the fence, so to speak – others may be totally unaware. Activities such as field days, news articles, fact sheets and other forms of literature and promotion, will help spread the word. Something to keep in mind is that one success does not lead to total acceptance. Repetition is often the best recipe. Generally, the more success you have, the more people are willing to accept the new idea and adopt the new practice.

Vol. 8 Summer 2001 – Rural Water Quality Concerns Everyone

by: Brian Harris

The safety of rural water supplies was once taken for granted. Problems such as ground water hardness and/or excessive iron content was either put up with, or dugouts constructed and surface water used. This situation may be changing, however, as rural residents become more aware of the origin(s) of their water and what safety concerns may be present.

Public health officials throughout North America have long promoted the need to have rural drinking water supplies tested for nitrate. As part of its public health mandate, the Provincial Laboratory of Saskatchewan Health provides testing for nitrate and total coliforms in both well and dugout water. Several thousand samples are submitted annually for analysis.

Nitrate is highly water-soluble and therefore tends to migrate from soil to ground water. Natural sources of nitrate in the environment include decaying matter - both plant and animal - as well as leaching from geological formations. Human activities resulting in the release of nitrate into the environment include the disposal of domestic sewage, livestock operations, and the use of nitrate-based fertilizers. Manure is a valuable source of nutrients for growing crops on the farm, however, manure also contains nutrients, organic matter and microorganisms that can contaminate water sources.

In some areas, cattle are commonly fed and bedded in low sheltered areas beside creeks, rivers, lakes or dugouts. Manure accumulation at these sites is one way water quality is affected. The manure pack can contribute contaminated runoff to adjacent water sources during spring snowmelt or heavy rainfall events. Water sources contaminated with manure contain fecal coliform bacteria and may have other disease-causing microorganisms such as cryptosporidium, giardia and toxic strains of E. coli. These microorganisms are a threat to public health and reduce cattle weight and productivity.

While livestock manure tends to be a focal point because of its physical visibility, there are many other causes for the deterioration in water quality. Lagoons that eventually are released into watersheds; crop production adjacent to watersheds result in soil, nutrient and chemical loading; and natural sources of contaminants such as arsenic do occur.

Water quality is important to rural and urban residents as well as temporary users. As such, the responsibility for maintaining or improving quality rests with each of us. The first step in a co-operative approach to improving water quality is for everyone to understand the problem. Groups and associations such at the Big Shell Lake Watershed Stewardship Association (BSLWSA) are to be commended for their efforts in identifying factors that affect water quality in the Big Shell Lake watershed area, creating an awareness of the importance of water quality and educating the public with respect to remedial activities designed to maintain and improve water quality in Big Shell Lake for present and future generations.

Funding provided by the Agri-Food Innovation Fund (AFIF) over the last three years has provided resources for a "Pilot" project to assess and manage water quality issues within the Big Shell Lake Watershed. While Agriculture & Agri-Food Canada – PFRA have taken a lead role in this initiative, Sask Water and Saskatchewan Agriculture and Food have also been involved in the "Pilot". Much has been accomplished and reported over the past three years, however, as funding for this project winds down it will be up to local stakeholders to develop and implement a long-term integrated watershed management plan to monitor and address water quality issues as they arise.

Residents (including temporary users) of the Big Shell Lake Watershed will need to support the executive of BSLWSA in their efforts to enhance the quality of water in the Big Shell Lake recreation area. Stakeholders can begin by simply purchasing an individual membership in BSLWSA for a very nominal fee of $10.00 or by logging on to the BSLWSA website at http://bslwsa.icomm.ca/.

Vol. 9 Fall 2001– Drought Watch 2001

by Brian Harris

Extreme weather conditions in the prairie region during the 2001 growing season, particularly drought, is having a serious impact on many farm operations in western Canada. One only has to travel from Saskatoon to Swift Current in order to realize the extent of this year's drought. Surface water supplies have already disappeared or are disappearing with each passing week, pastures are bare, and sub-soil moisture reserves are practically non-existent. In fact, since 1900, only three years have rivalled this year's drought-like conditions – 1937, 1961, and 1988. The extent and impact on this year's drought may even be greater than previous droughts!

In response to this year's drought, Saskatchewan Agriculture and Food has included a Drought Watch page on it's website http://www.agr.gov.sk.ca/docs/about_us/programs_services/droughtwatch.asp. Topics covered on this website include: the latest crop report, maps, technical bulletins, links to programs and assistance, links to rainfall information, climate centres as well as other links such as information about drylands, Montana Natural Resource Information System and Statement on Meteorological Drought-AMS. Of particular interest to those concerned about water quality are sub-titles including: Dugout Water Treatment, Livestock Water Quality, and Testing Farm Water.

Agriculture and Agri-Food Canada (AAFC) has also published a series of comprehensive fact sheets – The Drought Situation, Implications for Canadian Agriculture and Assistance Available to Producers – to provide a national overview of the current drought situation, its impact on production and government programs in place to provide assistance to affected producers. These factsheets, along with other articles including: Farm Financial Programs Web Site, PFRA – Drought Watch on the Prairies, and Provincial Agriculture Sites may be found on AAFCs website http://www.agr.ca/drought/index_e.html

Livestock producers might be interested in knowing that a study, initiated in 1999 by the Western Beef Development Centre (WBDC) and branches of Agriculture and Agri-Food Canada (AAFC) (Prairie Farm Rehabilitation Administration (PFRA) and the Research Branch) was conducted at the Tremuende Research Farm to determine the effect of various water quality types including simple water treatments on weight gains of cattle. The four water types and treatments were: 1) direct access by livestock to the dugout; 2) pumped from the dugout to a trough; 3) aerated and pumped to a trough; and 4) coagulated and chlorinated water pumped to a trough. Parameters monitored included: animal weight on a monthly basis; parasites in fecal samples at the beginning and end of the study; water consumption and water quality; climatic conditions (including rainfall, wind and air temperature); water temperatures; forage production, consumption and quality; and cattle behaviour. The results of this 2-year study funded by the Canada-Saskatchewan Agri-Food Innovation Fund are contained in a report entitled *Effect of Water Quality on Cattle Weight Gain – 2000*. Copies of this report may be obtained from Bart Lardner, WBDC, Room 129-72 Campus Drive, Saskatoon, Sk. S7N 5B5

Drought affects everyone. In years of drought, the quantity and quality of surface water can have a huge economic impact on producers, recreational sites, tourism, and retail outlets. It is events such as those that occurred in Walkerton and in North Battleford, however, that catches our attention and makes us aware of the importance of good water quality. The challenge for all of us is to do our part in maintaining and improving the quality of water for our use and for those who may follow.

The Big Shell Lake Watershed Stewardship Association (BSLWSA) will need the support of everyone residing in the watershed area as the association develops a long- term management plan for Big Shell Lake. Only with the support of those in the watershed area can the goals and objectives of the association be met. Complacency leads to in-action, and in-action perpetuates the status quo. Neither is acceptable if the objectives of BSLWSA are to be realized – the future of the Big Shell Lake recreation area is at stake!

Perspectives from Sponsoring Organizations

Agriculture and Agri-Food Canada's Perspective on the Big Shell Lake Watershed Community Management Project

By Garet Cormin, District Manager

The exploration and understanding of how local people can be effectively involved in the decision-making process and management of resources in their own community was a main goal of this project.

Funding has been provided for this project by the Canada Saskatchewan Agri-Food Innovation Fund. It is important to state that this program has its roots in wanting to have the agriculture industry be fully conscious of, and responsible for, its impacts on the environment. With that stated, we must note that one of the fundamental concepts of environmental science is that one must take into account everything in our environment and that every thing and every action has an impact, no matter how small.

The challenge in trying to understand what impact agriculture has is to differentiate the parts that make up our environment, and to understand what each of their impacts are. As a community of people located within the environment of the Big Shell Lake watershed, you have been asked to play a significant role in answering these questions. Big Shell Lake has factored highly in your community's discussions, as it is a very prominent part of the landscape and is a focal point in this community. Other parts of your environment are not so visible or easy to related to. You have been asked to step back and try to see all the pieces of your environment.

The idea that a community can understand its immediate environment, and be responsible for making decisions that affect it, is a relatively new one. In the past, governments often made decisions for people without much direct input. What is new is the degree to which there is a partnering of the decision-making process.

So, after five years, how well have we done? I have had a chance to be part of this project, at its inception, and now at the conclusion. One thing that has impressed me most is the commitment and energy of those people in the Big Shell Lake community who gave their time to be part of this project — making time to meet, showing a desire to learn new ideas, and most importantly, exhibiting a willingness to look at things from a different perspective.

The committee members have included people from the farm population and from the resort communities adjacent to the lake. You have also adopted into your community representatives from the provincial and federal governments, who have worked alongside you towards your goals. For many of you, this has meant putting aside your differences, or at least being willing to allow each other to have and express those differences. It also meant that rather than pointing a finger at a perceived threat, people have had to step back and take the time to sort out and understand the issues.

In the broadest sense, there were three main goals identified at the outset of this project: To assess water quality issues; to select and demonstrate various remedial options; and to develop and implement a locally acceptable plan to address and monitor water quality issues.

I would say the record presented in this long-term management plan supports the claim that the goals have been met. After five years, I think it would be fair to say that members of the community have been able to work together and make progress in understanding the environment they live in. With this understanding, decisions have been made to take corrective steps aimed at improving the situation. It would be safe to say that additional learning is required, and that future corrective steps need to be taken. Exactly how this will happen is not certain. But it is safe to say that community involvement in managing the environment around us will continue to play an important role in our society.

So as you sit around your kitchen tables and reflect on what you have accomplished, take time to acknowledge your successes. First, you formed a functioning group that is fairly representative of the community within the watershed that continues to operate five years later. Second, significant evaluations have been carried out on the land use and water quality within the watershed. Third, projects have been implemented that work toward demonstrating effective land and water management. And fourth, but not least, you have effectively communicated your plans and actions to your immediate community.

Word of your success is reaching others through public meetings, newsletters, attendance at national conferences and through your web site. I think it is appropriate to congratulate yourselves for a job well done, and for the effort you have put into this project.

If I can, I'd like to leave you with some closing thoughts: as you continue your search to understand and maintain the environment you live in, you will find partners who are there to work alongside you. Your efforts to plan your actions will make it easier for those partners to be there with you. The partners will no doubt change as the issues change. It has been a special honour and privilege to be able to represent the Department of Agriculture and Agri-Food Canada, as one of the many partners on this project.

Sask Water

Don Dill, Manager, Regional Water Resource Office

When Sask Water became involved in the Big Shell Lake Watershed Stewardship project, we had several interests and goals that led us to support the project. As a part of our mission to manage, protect and develop the province's water and land related resources, we have a goal of increasing public awareness and understanding of water resource management. To pursue this goal we support education and research that will identify the value of the water resource. We undertake actions to protect and enhance the environmental and aesthetic values of water, and we encourage public involvement in the broad context of water management.

The activities of the BSLWSA and their initiatives involving so many people within the watershed have met and surpassed our initial hopes for this project in many ways. Some examples are:

- Because of this project I feel an awareness of the issues that contribute to the degradation of water quality, both within this watershed and on a broader provincial spectrum, has substantially increased.
- I believe the monitoring activities and research work has provided a base of information which not only provides a snapshot of present conditions, but will be invaluable in future years in providing baseline data to evaluate future changes.
- I believe the monitoring work has been instrumental in motivating the resort communities and others to look at the impacts of their existing waste management practices, and is providing impetus for stakeholders to construct more secure facilities.
- I believe the cooperation of the farming community around the lake to undertake actions to limit livestock movement in riparian areas has changed the dynamics of the local community and will become a catalyst for increased future communication.
- I believe the experiences gained by the BSLWSA will provide a template to follow for other people interested in working together to protect watersheds.
- Last but not least, I believe the work of the volunteers and the government agencies involved in the BSLWSA project have shown that by working together you can accomplish much more than working at an individual level.

Although this phase of the project has ended and planning is underway for preparing longer range management plans of the watershed, in reality the work to protect a watershed never ends. Just like the lake, people and their activities and the watershed itself are in constant change and the impacts of those changes will need to be assessed.

Sask Water thanks all the stakeholders who have played a part in the activities for their time and commitment, and hopes each person will continue to play an important role in protecting the future water resources in the watershed. Sask Water will continue to support these future efforts.

Sask Ag & Food

by Brian Harris, Extension Agrologist

Saskatchewan Agriculture and Food, Extension Service has appreciated the opportunity to work with the various agencies, groups and individuals who have undertaken a study of issues related to water quality in the Big Shell Lake watershed area and who have actively supported the goals and objectives of the Big Shell Lake Watershed Stewardship Association over the last 4-5 years.

My involvement on BSLWSA's "Advisory" Committee has provided me with an opportunity to work with multi-disciplined professionals and a concerned stakeholder group dedicated to improving water quality in the Big Shell Lake watershed area. Individuals with varied backgrounds have come together as a team to promote an awareness of water quality and have identified a number of steps that need to be taken in order to maintain and, hopefully, improve water quality in the Big Shell Lake watershed area.

The importance of maintaining water quality in recreational areas and on agricultural lands cannot be over-emphasized, especially in light of last year's drought and recent occurrences that have made headline news in the national press. Previous studies have suggested that ground water contamination is potentially a serious problem in rural areas and now we hear that some Saskatchewan wells have levels of arsenic that exceed national safety standards. Finally, one does not have to look very far to see that surface water supplies have all but disappeared in many areas of the province, a situation that may have dire consequences for livestock producers.

Although this AFIF-funded study is complete, the job of maintaining and improving the quality of water within the Big Shell Lake watershed area has really just begun. It is now up to the many stakeholders in the watershed area to do their part in improving the quality of water in the watershed area so that those who come after us may also enjoy the benefits that this recreation area has to offer.

A lot of time and effort has gone into developing a long-range management plan for the waters of Big Shell Lake. Now, it is the responsibility of all stakeholders in the watershed area to implement this plan, to make improvements to the plan when required, and to work together in a spirit of co-operation to ensure that the many hours of work undertaken by the BSLWSA board of directors and associated advisory committee have not been in vain.

In my view, and with stakeholder support, this "challenge" will be taken up by BSLWSA's dedicated Board of Directors. Implementation of a feasible long-range management plan is critical if the goals and objectives of the Board are to be realized for the benefit of all users of this valued recreational area.

Saskatchewan Environment and Resource Management (SERM)

Len Sinclair, Manager, East Boreal Eco Region Environment Section

We at Saskatchewan Environment and Resource Management have enjoyed our involvement with the Big Shell Lake Watershed Stewardship Project over the past 5 years. When the project began, it was one of the first attempts at managing lake water quality based on a holistic, watershed stewardship approach. With SERM moving towards an ecosystem based management strategy in 1997, the BSLWSA was a perfect opportunity for partnering with a group of stakeholders of various interests and backgrounds, with the goal of understanding and protecting a natural ecosystem. Our relationship with the BSLWSA has shown the range of considerations needing inclusion in a truly holistic approach to water management, and the watershed stewardship paradigm will prove a valuable model for other areas of resource protection within our mandate.

The cooperation experienced when collecting scientific data associated with water and sediment quality measurements, has shown that partnerships and stewardship associations are a very effective and enjoyable method of performing resource protection activities. As well, the level of understanding amongst all stakeholders and the various interest groups including livestock producers, cottage owners, and environmentalists has increased dramatically in the Big Shell Lake watershed. The polarized perceptions of each interest group have all been overcome to varying degrees, which will prove invaluable for continued understanding of the real issues and concerns affecting the water quality in Big Shell Lake.

As the BSLWSA moves out of this stage of the project, where funding allowed for significant expenditures in both monitoring and water quality enhance-

ment and preservation developments and projects, it will be up to the stakeholders and association members to follow through on the findings of the project. I have no doubt that the BSLWSA Board of Directors will continue to seek more answers to unanswered questions, as well as ensure the continued education of all watershed residents regarding their responsibility to protect and maintain the water quality in Big Shell Lake.

In conclusion, SERM would like to thank the BSLWSA and all stakeholders who played a role in seeing this project through. The BSLWSA project has been a valuable learning opportunity for us all, and will continue to provide an example to other groups and jurisdictions who seek to undertake their own projects utilizing watershed management through stewardship. SERM will continue to support the BSLWSA and other stewardship associations in this important and meanwhile endeavour.

Appendices

Appendix A: President's Messages

Vol. 1 – Winter 1997

by Don Barilla

The 'Big Shell Lake Community' Watershed Management plan was proposed by the PFRA and is made possible through funding provided by the Agri Food Innovation Fund - which is administered by Saskatchewan Agriculture and Food, and PFRA.

In the early stages, Mrs. Dianna Vaagen and Mr. Les Hunt were retained to organize and facilitate a steering committee to consider the merits, and to further the formation of an organization to accept the plan. After much work and many meetings the organization was formed and is now known as the Big Shell Lake Watershed Stewardship Association Inc.

The organization provides an opportunity for all stakeholders of the Big Shell Lake Watershed a unique opportunity to work collectively and cooperatively to resolve concerns and issues that may be identified which impact on the quality of the water in both the watershed and the lake.

This is a tremendous opportunity to enable us the stakeholders, to make a significant and lasting contribution and impact that will result in not only preserving the quality of the water in the watershed and the lake but to enhance it. By doing so, we will be preserving a beautiful natural asset that we have come to love and enjoy. This will also provide the same opportunity for our children and our children's children and on and on. What an opportunity! What a legacy! Further to all of this, we can, I believe, preserve and enhance the habitat for our waterfowl and wildlife. Maybe we can prevent what I consider a disastrous and sad situation like that which has caused our colony of Blue Heron to disappear. Isn't that a shame? Many of us looked so forward to their arrival every spring. By quietly approaching the island they lived on by boat, keeping a safe distance, we could show our children, our grandchildren and our visiting friends a bird that is otherwise rarely seen. How do you replace that kind of resource and joy? It may be gone forever. Let's not let things like this happen again.

I believe that by working together we can also protect and preserve the other resources of the watershed and lake, i.e. fish, waterfowl, animals and the included habitat. We must, because once they are gone, it is very difficult and sometimes impossible to replace.

Elsewhere in this newsletter you will find our mission statement, guiding principles, goals and objectives. I invite you to read them carefully. They spell out what the organization is all about. I also invite you to become a member and get involved. The success of our organization and our efforts can only be assured by involvement and co-operation of everyone.

During the summer of 1997 SERM (Saskatchewan Environment & Resource Management) carried out a program of collecting water samples in many locations on the lake and in the watershed. This program will be repeated this next summer and on an on going basis over the years to come. By analysing the samples in a laboratory, scientists & technicians can determine the quality of the water and identify if there is a deterioration and what needs to be done to correct it. Once this is done, we can then determine what remedial measures need to be taken. By carefully collecting this data and the facts and by working co-operatively with all concerned, we feel we can resolve the issues as they are identified. All of this takes time and of course takes funding.

The BSLWSA Inc. is a non-profit organization and currently, has a very small amount of funds. We will be entering into a contractual agreement with the PFRA and in so doing will access government funding through the Agri-Food Innovation Fund (AFIF) to enable us to fund administration, continued water sampling, and implement remedial measures as identified. Projects for remedial measures will be on a cost sharing basis and to the extent that funds are available.

As an organization we will be striving to raise funds in other ways and will need to be innovative and resourceful. It is our goal to become a self funded organization and be a steward of the watershed and Big Shell Lake for the years ahead.

Once again, I invite you to become a member, become involved and help us preserve and enhance this beautiful resource of ours.

Vol. 2. – Spring 1998

by Bob Norman

It is with some trepidation that I take over as president of the BSLWSA now that Don Barilla has decided to step down from the post. Don left a pretty big pair of shoes to fill (figuratively speaking, of course). Don guided the association through its formative year and set a high standard. But I take comfort in the knowledge that I am surrounded by a board of directors who are both talented and dedicated.

This project, which in its simplest terms is about local people taking control of their own environment, is an exciting one. It is the first such project to be launched in Saskatchewan. Other areas will be starting similar endeavours, but we are the prototype and so many eyes will be watching us to see how we do. And there is no doubt that if we all get involved, it will be a success. After all, it's not as though we are cleaning up Lake Erie or restoring the Atlantic cod fishery. (Although, come to think of it I suppose that our project is *similar*, but on a *really*; *really* smaller scale!)

This year will see another round of water sampling at the lake, for without the scientific evidence we cannot address any remedial actions. So far, much of the information we have on hand tends to be anecdotal: *"Heck! I remember that we didn't bother taking our rod with us when we went fishing. Just anchored in the middle of the bay and the fish would jump right in the boat. Pickerels, every last one of them. We threw back anything under four pounds. And the water was so clear you could see right to the bottom. Drank it right out of the lake if we were thirsty. Used it to top up the car battery, too."* Well, yes, okay. We do tend to look at the past somewhat through rose-tinted spectacles, but there is no doubt that the lake used to be better than it is today. Our preliminary testing has indicated that the lake has an excess of nutrients, probably from outside sources. Where from? Most likely a variety of places - washed in from farmlands, cottages, fertilized lawns, leaking septic tanks, from shoreline alterations and from who knows where? "So," the cottager may ask. "Are you guys going to come in and tell me, for example, that I cannot fertilize the grass *on my own property?*" Well, no, of course not. What you do on your own property is your own business. (Within reason, of course. After all, there are environmental laws that we all have to abide by). What we are saying is, before you do fertilize, stop and consider that when it rains, the fertilizer will be washed into the lake. So is it possible to have a buffer of some sort between your lawn and the lake? Or if you haven't yet seeded a lawn, is there some other ground cover that may be acceptable? Come to our Xeriscaping seminar this summer and find out. And before you dump sand on your property, consider that if it gets washed into the lake it will not only add nutrients, for sand often contains impurities, but it will also take out the weeds that anchor the shoreline and provide fish habitat. "Wait a minute," I hear you say. "On one hand you tell me that I'm making the weeds grow, and on the other hand you tell me that it's a bad thing that I'm taking weeds out. What's the matter? Can't make up your mind?" Well, no. (Or is it *yes?*) It sort of gets complicated here, and this is where our technical consultants can explain things a lot better. (They don't say *weeds*, for example. They say *aquatic vegetation).* It appears that nutrient loading increases the *undesirable* weeds such as blue-green algae, whereas shoreline alteration tends to take out the *desirable* weeds (um, sorry, *aquatic vegetation)* such as the bulrushes. That's an over-simplification of a complicated issue, but it illustrates how we affect the environment.

"This is all very well and good," the farmer might say, "but what has all this to do with me? This watershed stuff is all for the benefit of the lake people. My farm may lie in the watershed, but I never go to Big Shell Lake. Why should I care?" Well, that's a good question and a difficult one to answer. It's undoubtedly true that the main beneficiaries of any improvements to the lake will be the cottagers and recreational users of it (and to a certain extent, the lakes downstream, such as Memorial Lake), but we all benefit from an improved environment. (Editor's note: Shell Creek does not flow in to Memorial Lake.) We are not going to come onto your land and start demanding that you change your farming practices. What we *may* say is something like, "Hey, we perceive a problem here. How can we come to a mutual agreement to rectify it? Let's sit down and discuss it." After all, the results may be beneficial to everybody. Did you know, for example, that studies have shown that cattle watered from streams have a higher rate of abortions and scours than cattle who

drink from dugouts? There may be cattle upstream excreting coliform bacteria, rotaviruses and coronaviruses into the creek. So maybe we can help you build a dugout. Who knows? Your cattle will be better off, the lake will be better off, and it's a win-win situation. Let's explore it.

It's **all a** question of attitude.

And we **are** being watched . . .

Vol. 3 – Winter 1999

by Bob Norman

I was going to entitle this article *President's Meanderings* because I don't really have a *message* to convey, but the Editor felt that such a title wasn't very professional. Nevertheless, here are my wafflings on some of the events of the past year:

Low Maintenance Creative Landscaping Which Conserves Water - How to do More With Less was the subtitle of the seminar on Xeriscaping that we sponsored last August at the Lions' Hall in Shell Lake. We have been advocating that lakeside residents should avoid trying to make their waterfronts resemble groomed city parks and so we arranged with Sara Williams of the Extension Division at the U of S to give a talk on how to create landscaping which doesn't have such a detrimental effect on the environment. Ms Williams has authored books on Xeriscaping, and is also the editor of the magazine *The Gardener For The Prairies*. Her talk was entertaining and informative. As it turned out, we needn't have booked the Lions' Hall - we could have held the event in my kitchen. The fifteen people who turned out would have fitted fine in there.

The Wells of Summer

One of our major undertakings last summer was to test water wells around the lake in order to check for contamination. The reason we did this, apart from being good guys who like to provide a public service, of course, is that water wells act as good monitors of contaminants that find their way into ground waters; and so if we find that the wells show high levels of contamination then it can be assumed that those contaminants are also entering the lake. The results of the testing are reported elsewhere in this journal but I'd like to add my own observations...

If you are wondering why your well wasn't tested, the simple explanation is that we didn't have time. We were under a tight schedule, so if you weren't around when we arrived at your cabin, we didn't have the luxury of calling back later in the day. We did the testing on the Monday of a long weekend because of the higher number of people likely to be at the lake. The samples had to be taken to the Saskatchewan Research Council lab in Saskatoon within 24 hours, so the sampling had to be done all in one day. We couldn't start too early - after all, you don't want us banging on your door at 6 in the morning when you are up at the lake - and we couldn't delay too long because folks are readying to go home by the afternoon. So we had to aim our efforts to occur roughly between the hours of 9 am and 5 pm. As it was, our two technicians, Irene and Brenda, didn't get finished until past 7.30 pm and were exhausted by the end of the day - there was a lot of crawling under decks to get at outside taps and so on. We tested 60 wells around the lake: 32 from Echo Bay, 22 from Big Shell Resort, 2 from Misty Grove, 2 acreages, 1 farm and the public campground. The lab tested the samples for coliform bacteria and when they *found* coliforms, they went back and checked to see if any of those bacteria were *E. coli* - the enteric bacteria that in some cases can be deadly. The presence of coliform bacteria - so named because they inhabit the colon (large intestine) of mammals - is obviously a sign of contamination. And we found such contamination in about half the wells that we tested. So we went back and re-tested those wells on the next long weekend. Now to be fair, we called a well contaminated even if there was only one colony of coliform bacteria found in the 100 mL sample. That's because the Sask Public Health guidelines state that "the maximum acceptable concentration for total coliforms in drinking water is no colonies of bacteria detectable per 100 ml. of sample." But one government publication I have read says that in reality, a count of five colonies or less can reasonably be ignored, provided that there are no *E. coli* present. And most cottagers haul their drinking water to the lake anyway. Mind you, one resident who had a count of 46 colonies of coliform bacteria on the first test and 9 colonies on the second test (such variations are quite normal in free-flowing aquifers) told us that he has been drinking his well water for years, totally untreated, with no ill effects. Nevertheless, I think that it would be prudent to install some sort of water treatment system, such as an under-the-sink filtration unit or an ultraviolet sterilizer, if you plan on drinking your well water.

It is difficult to determine where the low-count bacteria come from - there could be a beaver pond or livestock operation several kilometres away where the aquifer runs, for example. But we did have a dozen or so wells that had very high bacteria counts - in one case 1200 colonies per 100 ml. - and the most likely explanation for those high counts is that there are leaking or overflowing septic tanks nearby. Only one private well had E. coli bacteria, but interestingly, both the public well at the Resort Village of Big Shell and the well at the public campground on the north-east corner of the lake tested positive for *E. coli*. A notice on the Big Shell Resort pump indicated that when it had been tested in April no bacteria had been found. Obviously the activities of summer changed that situation. A sticker on the pump at the public campground warns that for safety, the water should be boiled before use. This is advice well heeded.

Weeds, Weeds and More Weeds

This past summer saw more vegetation in Echo Bay than most people can remember in recent years. To say that it was unpleasant understates the obvious. One of the reasons for the increased weed growth was because water levels were very low, which allowed sunlight to penetrate to the bottom and stimulate the weeds. And weed growth becomes a vicious circle because as the weeds die off and decay they produce the nutrients that provide for more weeds. And of course, human activity around the lake provides extra nutrients, too. If we get good snow melt and spring rain, the increased water in the lake will help alleviate the problem to a certain extent, but there are questions as to whether or not there are things we can do to help the situation. Probably not. Cutting the weeds is not the answer because that stimulates them to grow back thicker than before. And it's expensive. There are companies that specialize in lake weed removal (at least, there are in the larger markets) and I did hear one story of a lake in Ontario that contracted with such a company to cut their weeds. The next year the weeds grew in worse than before, so they had to call the contractor back in again. It ended up with the company owner building himself a cabin at that lake because his income was assured for years to come! So cutting weeds starts you on a slippery slope. There are some chemicals that supposedly remove undesirable weeds and do not harm the fish, but they are very expensive. We are loathe-to start dumping chemicals in the lake, anyway, not that we'd get permission from the government in the **first** place. One interesting way to control weeds is to introduce *a grass carp* - a fish that feeds exclusively on vegetation. It has been tried experimentally in the U.S.A. The number of fish introduced has to be calculated so that they strike a balance with the weeds.

Too many fish would eat all the vegetation and they would then die from starvation. Too few fish wouldn't make any impact; and anyway, the lake *needs* a proper balance of weeds. The fish embryos are irradiated so that they are sterile and cannot reproduce. But the experiments with these fish have only taken place in ponds and reservoirs, not lakes. Even though they are sterilized, there is a concern that if they escaped into the ecosystem they could cause damage. If you assume that sterilization is 99.9% efficient, with 100,000 fish that still means *theoretically that* 100 fish would not be sterile. So **if** we were allowed to try this experiment in Big Shell Lake, we would have to put a net across Echo Bay to hold the fish in for the summer. (This would be a one-year experiment. The fish would die out in the winter). Putting a net across the bay entrance means that there would be no exit/entrance to Echo Bay by water, so boaters would have to make the decision to either take their boats out of the bay before the nets went across, or leave them in the bay for the summer. We know *that* idea would float like a lead balloon. Besides, the chances of us being allowed to try such an experiment are slim indeed. Not to mention the ethical question of using live creatures for our own ends...

If You Can't Catch 'Em, It's Not Because They Aren't There.

This past summer I had the opportunity to accompany John Weir from the Fisheries Department when he conducted a test netting on the lake (it's one of the perks of being involved with the BSLWSA: you should try it!) John's report should be elsewhere in this issue. I had always assumed that there were more jackfish than walleye in the lake because I hardly ever catch pickerel. I was amazed to find out that the walleye outnumber the jacks by about 7 to 1. It's just that the walleye are more picky eaters, I suppose. The lake has enough nutrients in it to keep the pickerel happy and unless the fisherman/woman presents a hook that *really* piques a

pickerel's interest, the fish will ignore it. I now have a new-found respect for the successful walleye angler. I'm also happy to see that the lake has a really large, healthy fish population. Just, um, don't tell anybody, eh?

Vol. 4 – Fall 1999

by Doug Wilson

Welcome to issue number four of *News of the Shed*, my first as president of the BSLWSA. We, the Board of Directors, are very proud of our newsletter. Our distribution has expanded to include many lake management societies in Canada and the United States. It has received many excellent comments from all our readers. It is our hope that good reporting and the information in this issue will also meet your approval.

Rebecca Kennel, our newly hired Project Coordinator, will be responsible for *News of the Shed* this time. We know you will enjoy the format as we take our newsletter to new heights. Rebecca will also head up our Education Program for schools and work closely with the President and Board to further advance the objectives of the BSLWSA. Welcome Rebecca!

We are sorry to lose Brenda Thurston, our SERM technician, who has worked tirelessly on our water sampling. Brenda has accepted a position with the City of Prince Albert. We congratulate her on her success and wish her all the best. Brenda has worked closely with the BSLWSA's own technician, Irene Miszaniec, who will continue with the necessary work. Irene has been solely responsible for the sampling at the piezometer stations and will continue to do surface water sampling. Unfortunately, with the loss of Brenda, some important core samples will be delayed until spring.

As the BSLWSA moves forward with our project it is becoming increasingly clear that we are not alone in environmental and watershed studies and remediation. Many jurisdictions are closely monitoring this pilot project and are anxiously awaiting our tabulated results. Increasing awareness of the BSLWSA is a direct result of our association's membership in the Provincial Association of Resort Communities of Saskatchewan (PARCS) and North American Lake Management Society (NALMS). On the local front, awareness has been increased by presentations and displays at the R.M. of Spiritwood ratepayers meeting, the R.V. of Echo Bay & Big Shell spring ratepayers meetings and at the Saskatchewan Conservation and Development Association Convention in Saskatoon. We also hope you noticed our float in the Shell Lake Hey Days Parade. We thank all our volunteers for helping to make these events happen.

Future Plans include a display at the PARCS Convention on October 22, 23 and a very exciting project will be to participate in the Year 2000 National Convention of the Canadian Coalition of Provincial Cottager's Associations (CCPCA). One of the BSLWSA's strongest promoters and supporters is Mr. Les Hunt, Executive Director of both PARCS and the CCPCA. Through his many contacts we have access to a wealth of information that is so valuable to the success of the BSLWSA. Individual memberships in PARCS are encouraged. Call me for details.

In this issue you will find an extensive report on the watershed and lake water testing results. Results of the test well sites on the lagoons (piezometers) are now being tabulated and will be reported in future issues.

Also, watch this issue for detailed information on an exciting event, the Watershed Information Seminar, sponsored by the BSLWSA on October 16th. **Everyone** should attend this provincially promoted event, listen to the qualified speakers, have coffee and participate in discussions of mutual interest. This is for the public and we urge you to attend.

Remember to mark your calendar for SATURDAY, OCTOBER 16TH at the SHELL LAKE LIONS HALL.

The Board of Directors would like to thank all of you who returned Surveys. Tabulated results are in this issue. We do, however, have a concern that many have not renewed their memberships. ***A Strong Association Must Have a Strong Membership Base.*** Please help the BSLWSA by returning your membership right away.

Read on, enjoy, participate. Attend the seminar on October 16th. See you all there.

Vol. 5 – Winter 2000

by Doug Wilson

I would like to wish everyone all the best for the New Year 2000 and hope it will be a happy and healthy start for the 21st century. As we start the New Year and new century, it makes one wonder just what the world will be like at the end in 2099. Most of us have seen so many changes in the last 50 or 60 years, we can only imagine what our children and grandchildren will see in their lifetime. One thing we can count on, there will be changes. Just what and how great

those changes will be, only time will tell. We can only carry on and wait and see what those changes will be and make the best out of what we are given.

What will be ahead for the BSLWSA? What changes will our lake and watershed have in store for us? What will cottage country look like, the cottage way of life? Will there still be a cottage way of life? What will the family farm look like, how will agriculture change? We all have seen drastic changes to the farming way of life. Will the family farm still be viable? We all hope so and we also have the ability to insure that we do indeed continue to enjoy this lifestyle that we have become accustomed to. We have this ability, this control, in how we use the environment in which we live. The protection of the environment in which we live is paramount to protect our way of life, as we know it.

The 21st century is going to see ever more importance placed on the protection of our water supplies. I'm sure you all have heard in the news media reports recently of cross border export of Canada's water resources? This has only become an issue because of a deteriorating supply of quality drinking water in the US and overseas. We must be very conscious of the importance of protecting our water supply, both surface and ground water aquifers. We are very fortunate in Canada to still have a reasonably safe supply of quality drinking water. Now is the time to start emphasizing the importance of protecting this resource so we will never have to go looking for our water somewhere else.

The BSLWSA has been asked by Sask Water to attend and be a session presenter at the *Canadian Water Resources Association National Convention* in Saskatoon, June 21st –23rd 2000. This is the second national conference that we have been asked to attend to present our program and the results of the testing that has taken place within the watershed study. So the year 2000 is becoming a very busy year for the BSLWSA board and myself.

Now we must answer your question, **"Why should I become a member in the BSLWSA?"** As you must be aware, we receive government funding for all the administration and testing costs incurred in the operation of the BSLWSA. There is also funding available from many other sources to carry out what ever programs the board decides on. But in order to present sound reasonable arguments as to why we should receive funding for our programs, we must prove strong membership support. Government and, even more so, private corporate funding is almost always awarded after determining the strength of community and membership support. There are many important remedial projects that will be undertaken this year, and we need your membership support to help the board to secure the funding to continue with these programs. So when you receive your membership notice for year 2000, please fill it out and return ASAP.

So read on, enjoy this issue, study the reports and discuss the topics! **THE BSLWSA NEEDS YOU!**

Vol. 6 – Summer 2000

by Doug Wilson

Welcome to the July, 2000 issue of *News of the Shed*. We have lots of information for you on upcoming activities this year. The BSLWSA is moving forward with many of the programs that we have been talking about for the past few months.

The results of the year's collections of data from the sewage site piezometers are now being tabulated into the final report. The two resort villages have been informed of the preliminary results and have been in discussion with SERM. Once the final report is in, a decision for remedial action will be implemented by the resort councils.

The BSLWSA has also had three preliminary meetings with the fisheries branch of SERM about fish habitat restoration within the west creek and several shoreline areas. The feasibility study and cost estimates will be done this year and if approved, the work will be scheduled for spring and summer 2001. This will be a time when resident co-operation and volunteerism will be most appreciated. There will be much more information on this program as the study progresses.

All BSLWSA members and non-members are cordially invited to attend the Annual General Meeting and pancake breakfast at the Resort Village of Echo Bay Quonset on Sunday, July 9th. Five board members will be elected by the general membership. To vote you must have a current, paid-up membership. Details are on the back page.

You will be hearing a lot this summer about "managing your shoreline". July 21st - 23rd are three important days for you to mark on the calendar. The *Living by Water* Project and Nature Saskatchewan will be holding an on-site seminar. They have many ideas for environmentally friendly living on waterfront property

that we all enjoy so much. There will be an evening family social on Saturday, July 22nd at the Echo Bay Quonset. Watch your lake bulletin boards for time postings. Mr. Clive Callaway from B.C., executive director of The *Living By Water* Project, will conduct this program with the assistance of Margaret Skeel and Aimee Pettet from Regina representing Nature Saskatchewan.

By the time you receive this issue I will have attended the Canadian Water Resources Assoc. Convention in Saskatoon. The CWRA is a national organization of water resources professionals in the public, private and academic sectors dedicated to increasing awareness and understanding of Canada's water resources. This, the 53rd annual conference theme is, *Wetlands, Riparian Management and Climate Change and Variability*. The BSLWSA has been asked to give a presentation on how we were formed, why we were formed and what we are doing within our watershed study program. The BSLWSA is becoming quite high profile with-in Canada and many other associations are interested in what we are doing. We will share our many programs and study results. NOW, we need your participation and memberships, THEN we could show a very strong "Watershed Stewardship Association" that is doing great things for the protection of our lake.

Vol. 7 – Fall 2000

by Doug Wilson

Since the last *News of the Shed* the BSLWSA has been very busy and we have many detailed reports in this issue. Our watershed association is becoming increasingly well known and we are being included in the activities of many other organizations.

This past year has been very exciting for us. We have been represented and have made presentations at four national conventions. The value in attending and the information that we have accessed helps the BSLWSA board realize that we are not alone. Environmental concerns and the protection of our lakes and rivers is not just at Big Shell Lake, it's national, it's world wide. The people that make these organizations viable and strong come from all walks of life. There are universities and corporation executives and just plain concerned citizens who live and enjoy a healthy natural environment.

I have had the privilege to attend these conventions and to represent the BSLWSA, and have met many of the same people each time I attend. I am always asked, "How is your project progressing, what are the results, and do you have community support?" My answers are, "Monitoring is advancing, results are very interesting, remedial steps have and are being formed, and the community support has greatly increased."

July 21st-23rd the residents of Big Shell Lake and the BSLWSA were sponsors of the only *Living by the Water* Shoreline Ambassador Certification Weekend in Saskatchewan. This was a very successful event and enjoyed by all that participated. A further detailed report will be found inside this issue.

Our Annual General Meeting and our first Pancake Breakfast were another great success, a further report will be found elsewhere in this issue.

You, as members and residents of the Big Shell Lake Watershed, should be proud of the work and the exposure the BSLWSA board provides at the national level on your behalf. This association receives many inquiries from many jurisdictions asking how they can organize and do monitoring within their watershed.

You will find many reports and updates in this issue on all that has happened since the last issue of our newsletter. We hope that you will find this letter informative and we would like to hear your comments. Please write or call any board member. Guest editorials would be welcomed for future issues.

Vol. 8 – Summer 2001

by Doug Wilson

This issue of the *News of the Shed* will contain some very important and interesting reports of the BSLWSA monitoring program. Our feature SERM report will be by Todd Swenson on the surface water results and a report on the lake sediment core study. There will also be a major presentation at the Annual General Meeting on Sunday, July 8th by Dr. Peter Leavitt and Jim Rusak of the University of Regina. They analysed the core sample and compiled their findings into this report. This study presents an overview of the history of Big Shell Lake, and will be of interest to all residents of the Big Shell Lake watershed.

We must also take this opportunity to acknowledge the efforts of Karen Benjaminson, who has been our lead PFRA advisor to the BSLWSA board. Karen will be taking a one-year leave from her duties with PFRA. As caretaker of the "AFIF purse strings" she has guided the board and worked closely with our other govern-

ment advisors to see that this project succeeds. On behalf of the board and myself, we extend our gratitude and a "Huge" thank you Karen. Enjoy your time with your family. Karen's position will be taken over by Charles Salisbury. We look forward to working with Charles and continued success. Charles will be writing the PFRA report for this issue.

Our PFRA report will outline some of the remedial projects that are complete and a new project just getting started on Jim Palendat's farm. This property is on the inlet creek and an alternate livestock water source is being constructed.

A feature article written by Brian Harris of Sask Ag and Food gives a perspective of the importance given to water quality concerns in Saskatchewan.

Residents of the Big Shell Lake watershed, through your innovative initiative enabled us to become the first lake stewardship association in Saskatchewan, should be very proud of what you have created. The lake stewardship movement in Saskatchewan is going to see a surgence in size and growth in the coming months and years. The **BSLWSA**, along with the Stewards of Jack Fish-Murray Lake and the Friends of Goodspirit Lake Associations, in co-operation with the Provincial Association of Resort Communities of Saskatchewan (PARCS), have motivated our provincial government departments, Sask Water, SERM and Sask Ag & Food, to work toward a provincial lake stewardship program. This program will be called *Saskatchewan Watershed Stewardship Network*. It will include federal participation from PFRA, Department of Fisheries and Oceans and Environment Canada. Non-governmental organizations will be PARCS, Partners for the Saskatchewan River Basin and Ducks Unlimited.

Ontario's counter part to PARCS is the Federation of Ontario Cottagers' Association (FOCA). This provincial association is the fundamental backbone and supporter of the Lake Stewardship movement in Ontario and provides a working model for us to follow. Your continued support, through paid-up active membership in the BSLWSA will continue to keep our Big Shell Lake Stewardship program alive, a leader and innovator in Saskatchewan cottage country.

The PFRA funding through the Agri-Food Innovation Fund to the BSLWSA will expire on March 31st, 2002. Many have asked the board "Then what happens?" The board of directors is now working on formulating a long-term management plan for the Big Shell Lake watershed. These plans will include continued monitoring of the water quality in Big Shell Lake. It will not be as intensive or frequent, but will continue to a lesser degree. Government agencies will continue to be partners with the board and work toward remedial solutions and monitor the water quality in Big Shell Lake. Continued membership support and renewals will become very important to the success of the BSLWSA. The board will need to access other sources of funding to help augment finances from memberships.

An extensive final report will be written outlining the entire test results and data collected during the five-year mandate of the **BSLWSA**. The final report will be printed in manual form and will be available to organizations or individuals wanting a copy. If you or someone you know would like a copy please contact the board members to place your order for this manual. It is the intent of the board to have as many manuals placed in school/personal libraries and resource centres as we can.

All the valuable data gathered in the Big Shell Lake Watershed environmental impact study, shows us what is needed to ensure the health of our watershed and lake. Restoration and protection of the riparian shoreline areas and backshore wetlands should be a priority of all shoreline residents.

It is of utmost importance that we protect our shorelines. Shoreline protection is the fundamental principal for "living by the water". We must realize that to protect our lake we must protect our shoreline. Shoreline erosion is the greatest concern and contributor to nutrient loading of our lake. As shoreline residents, "OUR SHORELINES ARE IN OUR HANDS".

We encourage you now to read on and enjoy this newsletter with all the interesting reports, and we welcome any comments you may have regarding this issue. Please inquire around to see if you or someone you are associated with would like to receive a copy of the BSLWSA Final Report. Any one working in water resources or education will find this report to be very valuable to their field of interest. Written requests would be appreciated. Please place your order by January 2002 if possible. Thank you for being a supporter of the BSLWSA.

Vol. 9 – Fall 2001

by Doug Wilson

Welcome to the 2001/2002 fall and winter issue of *News of the Shed*. As a Big Shell Lake stakeholder, you have been receiving regular issues of our newsletter as we keep you informed of our monitoring program. You will also be aware that our program and agreement with PFRA and the financial support from the Agri-Food Innovation Fund expires on March 31st, 2002. After March 31st the BSLWSA will *look and operate differently*. The board of directors is now working on the long-term vision and appearance of our stewardship association. There will be some very major and visible changes after March 31st, 2002, most noticeable, the distribution of *News of the Shed*. Only active and annually current paid memberships will receive the newsletter and the issues will be in the format of annual updates. Paid memberships will become extremely critical for the success and survival of our association. We have had strong stakeholder support in the past, please continue your support of the BSLWSA.

The Board of Directors has received many inquiries and concerns from our residents during the past five years of our lake stewardship program. We are extremely pleased to receive all inquiries about the association's activities. This impresses on the board members and our government advisors that we are making a difference and increasing awareness of the importance of environmental protection. There have been some concerns raised about spending most of our funding in the agricultural community. As our funding agency is PFRA (a branch of the Federal Dept. of Agriculture and Agri-Food Canada (AAFC)), it is only natural that they would target agricultural concerns. These projects will indeed have an improved effect on the water quality of Big Shell Lake in the future. However, it should be recognized that in some cases additional costs were incurred by cooperating landowners who made changes to their farm operations. These changes, it is hoped will benefit all residents in the future with improved lake water quality.

Resort Village residents will benefit from all the ground water monitoring that has been carried out during our program. These monitoring costs also came from the PFRA funding, as did the funds for the surface water monitoring and lab results. SERM departments of fisheries studies were funded mostly by their own department budgets. As well, some of the lake-water monitoring lab costs were covered by SERM department budgets. Also the equipment that was required for these two monitoring programs was provided by our partnering government agencies. All of the man-hours of time the government personnel put into this program were also covered by department budgets. This part is known as "in kind" funding. It is always difficult to see the whole picture of how funds are allocated when only certain projects are visible to the eye. But the BSLWSA board has been very diligent in how our funds have been appropriated so as to garner the best results and represent the residents' best interests.

Our awareness in the rural community has greatly improved during our program. As a result we have received many calls from producers asking how to contact various government agencies for assistance. Our resort village residents also are becoming more aware of their impact on the lake water quality. Your BSLWSA board is extremely pleased with our progress and the success we have achieved during this lake stewardship program. I hope this has helped you to understand the finer aspects of the BSLWSA funding and how it was dispersed. I welcome you to read the many articles in this issue. **REMEMBER—YOUR PAID UP MEMBERSHIPS ARE VERY IMPORTANT TO OUR SUCCESS**

Appendix B: Chronological History of Meetings, Seminars and People

Activities

May 20, 1997 – Orientation Meeting – Resort Village of Big Shell Lake Community Hall
July 4, 1997 – Public Meeting – Shell Lake Lions Hall
1997 – 2001 SERM conducting water quality testing.
Aug. 15, 1997 – Founders Meeting – Resort Village of Big Shell Lake Community Hall
Sept. 14, 1997 – Meeting – Shell Lake Lions Hall
Sept. 14, 1997 – Board of Directors Inaugural Meeting – Shell Lake Lions Hall
Oct. 4, 1997 – Board of Directors In-service – Resort Village of Big Shell Lake Community Hall
April 26, 1998 – AGM – Shell Lake Lions Hall
August 15, 1998 - Xeriscaping Seminar
April 24, 1999 - AGM – Shell Lake Lions Hall
October 16, 1999 - Water & You Seminar
July 9, 2000 – AGM – Resort Village of Echo Bay
July 21-23, 2000 - Shoreline Ambassador Project
July 8, 2001 – AGM – Big Shell Lake Community Hall

Board Members

1997 - 1998

President: Don Barilla; 1st Vice President: Bob Norman; 2nd Vice President: Doug Wilson; Secretary: Dianna Vaagen; Treasurer: Ralph Banda
Directors: Doug Pitceathly, Mavis Bellisle, Linda Caswell, Real Diehl, Wendy Panchuk, Bob Wingerter, Carl Brown
Local Governments: R.M. of Leask #464; R.M. of Meeting Lake #466; R.M. of Spiritwood #496; R.V. of Echo Bay; R.V. of Big Shell.

1998 - 1999

President: Bob Norman; 1st Vice President: Doug Wilson; 2nd Vice President: Mavis Bellisle; Secretary: Dianna Vaagen; Treasurer: Ralph Banda
Directors: Don Barilla (Past President), Linda Caswell, Real Diehl, Wendy Panchuk, Bob Wingerter, Carl Brown, Robert Allchurch
Local Governments: R.M. of Leask #464; R.M. of Meeting Lake #466; R.M. of Spiritwood #496; R.V. of Echo Bay; R.V. of Big Shell.

1999 – 2000

President: Doug Wilson; 1st Vice President: Don Barilla; 2nd Vice President: Linda Caswell; Secretary: Anne Wilson; Treasurer: Ralph Banda
Directors: Bob Norman (Past President), Robert Allchurch, Mavis Bellisle, Jeannette Bowes, Carl Brown, Greg Bubnick, Real Diehl, Glen Hartz, Wayne Hiebert, Lindon Lessor, James Palendat, Larry Vaagen, Bob Wingerter
Local Governments: R.M. of Leask #464; R.M. of Meeting Lake #466; R.M. of Spiritwood #496; R.V. of Echo Bay; R.V. of Big Shell.

2000 - 2001

President: Doug Wilson; 1st Vice President: Linda Caswell; Secretary: Jeannette Bowes; Treasurer: Ralph Banda
Directors: Bob Norman (Past President), Carl Brown, James Palendat, Larry Vaagen, Doug Johnson, Brent Brew
Local Governments: R.M. of Meeting Lake #466; R.M. of Spiritwood #496; R.V. of Echo Bay; R.V. of Big Shell.

2001 - 2002

President: Doug Wilson; 1st Vice President: Linda Caswell; Secretary: Jeannette Bowes; Treasurer: Ralph Banda
Directors: Bob Norman (Past President), Carl Brown, James Palendat, Larry Vaagen, Doug Johnson, Brent Brewer
Local Governments: R.M. of Meeting Lake #466; R.M. of Spiritwood #496; R.V. of Echo Bay; R.V. of Big Shell.

Advisory Committee

1997 - 1998

PFRA: Garet Cormin, Karen Benjaminson, Wayne Frerichs; Sask Water: Don Dill; Sask Ag & Food: Brian Harris; SERM: Len Sinclair, Brenda Thurston, John Weir; Economic Development: Brian Lloyd; L & S Consultants: Lester Hunt

1998 - 1999

PFRA: Karen Benjaminson, Wayne Frerichs, Malcolm Black; Sask Water: Don Dill; Sask Ag & Food: Brian Harris; SERM: Len Sinclair, Brenda Thurston, John Weir.

1999 - 2000

PFRA: Karen Benjaminson, Wayne Frerichs, Malcolm Black; Sask Water: Don Dill; Sask Ag & Food: Brian Harris; SERM: Len Sinclair, John Weir, Brett Diemert

2000 - 2001

PFRA: Karen Benjaminson, Garet Cormin, Charles Salisbury, Wayne Frerichs, Malcolm Black; Sask Water: Don Dill; Sask Ag & Food: Brian Harris; SERM: Len Sinclair, Todd Swenson, John Weir, Brett Diemert

2001 - 2002

PFRA: Garet Cormin, Charles Salisbury, Malcolm Black; Sask Water: Don Dill; Sask Ag & Food: Brian Harris; SERM: Len Sinclair, Todd Swenson, John Weir, Brett Diemert

STAFF

1997 – 2002 Irene Miszaniec, Water Technician

1999 - 2002 Rebecca Kennel, Coordinator

Appendix C: Survey Data

Vol. 4 Fall 1999 - BSLWSA Spring 1999 Survey

by Rebecca Kennel

Understanding lake water quality

Earlier this year, about 325 questionnaires were sent to residents and cabin owners in the watershed to determine what the general understanding is of water quality. 31 questionnaires were returned and from those 31, the following results were tabulated. Another survey will be done at the end of the watershed project to determine what changes, if any, have occurred.

Most people felt they had a fair to very good understanding of lake water quality and rated the quality of water in Big Shell as fairly good. Poor water quality was generally defined as: too much weed and algae growth; lack of clarity; and having a bad odour.

Most respondents felt that the following activities have the most negative impact on water quality: lawn fertilizer/chemicals, pet waste, livestock grazing practices, cropping practices/farm chemicals, road salt, erosion, and destruction of vegetation adjacent to lake. When asked to rate these activities, livestock grazing, cropping practices, septic systems, and lawn fertilizer were thought to have the largest impact.

Assuming water quality is threatened, most respondents felt that the BSLWSA should focus on the following areas: agricultural and livestock practices, septic tank testing and installation, curb beach development, and control weed and algae growth.

76% of the people responding to the survey have known Big Shell Lake for more than 10 years. Another 14% for 6 to 10 years, and 10% less than 5 years. 70% thought the water quality has declined in that time period, while 26% thought it stayed the same. Most people blamed the change in water quality on low water levels and livestock and farm fertilizer and chemicals. Some of the other responses were poor waterfront development, leaking septic tanks, increase in irresponsible water-related activities and cutting trees along shoreline.

When asked if they had done anything to harm lake water quality, 69% responded that they had not. 45% thought their neighbour had done things to harm lake water quality. Most people said they would be willing to make simple changes to their landscape to reduce run-off and erosion.

About half of the respondents had noticed monitoring activities in the watershed.

Final Survey, 2002

by Rebecca Kennel

In February, 2002, a final survey was mailed to 339 residents and cabin owners in the watershed. Over 13% responded to the questionnaire.

In comparison with the first survey, more people (58% compared to 40%) felt they had a very good to good understanding of the components of lake water quality.

The same activities were named as having the biggest impact: cropping practices, livestock grazing, septic systems, and lawn fertilizer. The activities that are thought to have the least impact on the quality of lake water in the watershed are: pet waste, litter/leaves and grass, removal of aquatic weeds, power boats, and developing sandy beaches.

59% claimed that their concept of water quality has changed.

Areas that respondents felt the BSLWSA should attempt to resolve were: water levels, liquid waste disposal site, septic system monitoring, shoreline alterations, and agricultural practices.

74% of the respondents have known Big Shell Lake for over 10 years, and 82% of these feel that the water quality has declined over that time.

Compared to the first survey, the same percentage felt that they had done nothing to their property that would harm lake water quality, and fewer felt that their neighbours had.

41% of the respondents have made changes to their landscape to reduce run-off and erosion, while 43% stated they have not made any changes.

87% of the respondents felt that the monitoring and remedial activities in the watershed were worthwhile and most found the *News of the Shed* interesting and informative.

Appendix D: Involvement with Other Groups

Nature Saskatchewan

Vol. 5 Winter 1999/00 – Help and Encouragement for Waterfront Residents

by Margaret Skeel

"Working towards healthier human and wildlife habitat along the shorelines of Canada."

Individuals can make a crucial difference in protecting and restoring wildlife habitat on their waterfront lands. This is an essential premise of The *Living by Water* Project, a project focusing on "the ribbon of life" where land, water and air meet.

Endorsed as a Millennium Initiative by the federal government, The *Living by Water* Project is raising awareness across Canada about the importance of shorelines in our lives. The project was founded in British Columbia by Clive Callaway and Sarah Kipp, two waterfront residents who were frustrated with the difficulties of accessing information on how to live environment-friendly lives and protect their lake. In the Prairies, The *Living by Water* Project is being developed and implemented by Nature Saskatchewan, a volunteer-driven conservation organization, and other partners.

The project promotes a shoreline-friendly lifestyle by highlighting the benefits of healthy waterfront areas to people and wildlife. Waterfront residents will be provided with tips on how to save time and money and safeguard their health naturally. Some of the services and products include: workshops, homesite assessments, a handbook, a video, and a number of educational materials such as brochures and an activity sheet. Waterfront residents can participate in a unique Conservation Pledge Program, whereby they pledge actions to protect and restore shorelines along their properties, and are invited to share their own stories on waterfront living.

Everyone is invited to become a Shoreline Ambassador within a Pilot Project at Big Shell Lake - The Homesite Assessment and the Shoreline Ambassador Certificate programs will be piloted here in the spring and summer of 2000. All residents will be invited to participate as Shoreline Ambassadors by pledging an action of their choice to protect, conserve, restore or enhance their shoreline. Also, we will be looking for several waterfront residents to participate in a homesite assessment to identify and implement simple, environment-friendly changes they can make.

Nature Saskatchewan will be hiring a summer student for 6 to 8 weeks to work with the Nature Saskatchewan and the BSLWSA. A university student is preferred, but we will consider high school seniors. For a job description phone Margaret at 1-800-667-4688 or Doug Wilson, BSLWSA at 427-2128.

Margaret Skeel, Program Coordinator - Nature Saskatchewan, Room 206, 1860 Lorne Street, Regina, SK S4P 2L7 Tel: (306) 780-9273, Fax: (306) 780-9263 Email: mskeel@unibase.com

Sarah Kipp and Clive Callaway - Project co-founders and lead authors. Tel: (250) 832-7405, Fax: (250) 832-6874 Email: lbywater@jetstream.net

Doug Wilson, President, BSLWSA. Phone: (306) 427-2128 Fax: (306) 427-4553 Email: syblas.echobay@sk.sympatico.ca

Vol. 7 Fall 2000 – Shoreline Ambassador Weekend

Living by the Water Project

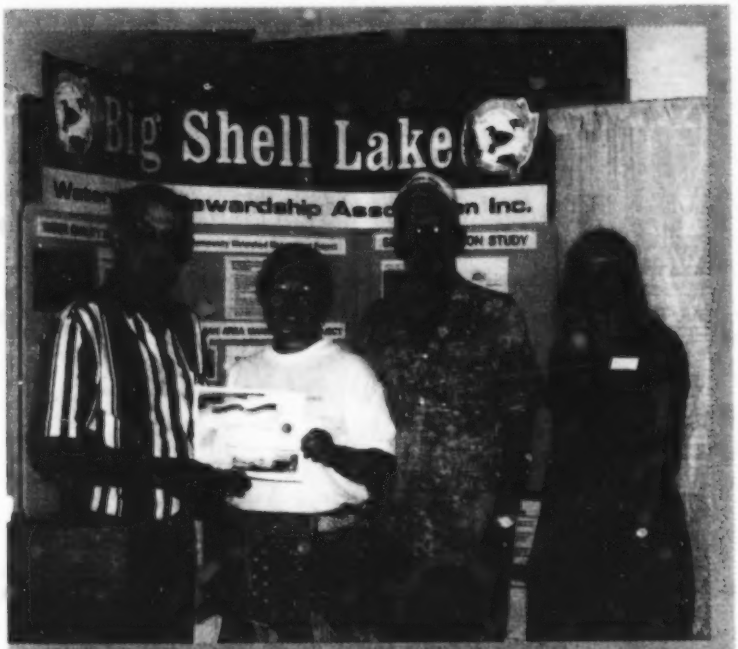
by Doug Wilson

The BSLWSA sponsored Nature Saskatchewan and The *Living by Water* Project weekend workshop on July 21st-23rd. We feel it was an overwhelming success. Our special visitors included Clive Callaway (B.C.), and Margaret Skeel and Amy Pettit from Nature Saskatchewan in Regina who conducted and coordinated the event to promote environmentally friendly shoreline living. The board of directors of the BSLWSA extend their thanks to the Echo Bay families of Dennis & Beth Johnson, Gene & Adele Belyk and Ernie & Audrey Rawlyk, and the Big Shell families of Carl & Jackie Brown, Andrew & Myrtle Marquis and Jack & Marie McMunn for letting the "Shoreline Ambassador" program assessors use their property for this workshop. A big THANK YOU goes out to all the participants who watched the assessments. A special "PAT on the BACK" goes out to Carl and Jackie Brown for their effort in having the most neighbours attend the Shoreline Assessment of their property. A thank you also goes to Bob and Delores Norman and Martin Bernier who followed

the assessors to most of the sites. Everyone who attended learned about the importance of good shoreline management. At a potluck supper that followed, a formal presentation by Mr. Clive Callaway made for a very informative and interesting social evening. We hope all that attended enjoyed it.

PARCS had an information display that was tended by Mr. John Cameron. As stated previously, PARCS has been our best friend and has helped to promote our Association at every opportunity, and we thank them for all their support and were happy that they joined us.

Big Shell Lake had a couple of very heavy rain falls this summer. I'm sure all residents saw the effects of unprotected shorelines and the tremendous erosion that took place as a result of the heavy run-off. Heavy run-off such as we saw during these storms washed many nutrients into the lake and the result was a very heavy algae growth. Shoreline erosion is the greatest source of nutrient loading of a lake, and it is the easiest condition to remediate. When will we learn that we cannot continue to alter shorelines and destroy bordering wetlands. These are nature's most efficient protectors and filters of the lakes and rivers that we enjoy so much. This is the foundation and principle for existence of the *Living By Water* Project and the Saskatchewan Wetland Conservation Corporation. It's time we all "take up the cause" and change the way we use our lakes, or we may not have a usable lake 20 years from now.



Adele & Eugene Belyk receive the Shoreline Ambassador Certificate presented by Doug Wilson and Margaret Skeel

The Living by Water Project Pilot

by Tara Schmidt

Big Shell Lake was the site of Saskatchewan's first pilot of The *Living by Water* Project's Shoreline Ambassador and Homesite Assessment Programs! The pilot was held at Big Shell Lake on the beautiful summer weekend of July 21-23, 2000.

Everyone at Big Shell Lake is invited to become a Shoreline Ambassador, to adopt more environment-friendly lifestyles to 'save time and money, naturally, and protect your health and wealth, naturally'. Let's see how many Shoreline Ambassadors we will have at Big Shell Lake! You are a model for other groups.

The July 21-23, 2000 weekend itinerary included six Homesite Assessments, an open house, a presentation and a social evening, complete with a potluck supper. We were very excited to have Clive Callaway, co-founder of The Living by Water Project, perform the Homesite Assessments. The residents who attended the weekend workshop received invaluable information regarding healthy water and shorelines. We thank all who participated to make the weekend a success! We would like to extend a special thanks to the six families who volunteered their homes and time for a homesite assessment: Andrew and Myrtle Marquis, Carl and Jackie Brown, Dennis and Beth Johnson, Ernie and Audrey Rawlyk, Gene and Adele Belyk, and Jack and Marie McMunn. The Homesite Assessment manual is currently being revised to incorporate ideas forthcoming from the pilot at Big Shell Lake.

We would also like to express gratitude to Big Shell Lake Watershed Stewardship Association for partnering with The Living by Water Project to make this pilot possible. We hope other stewardship and cottage groups will follow in your footsteps and 'work towards healthier human and wildlife habitat along the shorelines of Canada'.

The final phase of the Shoreline Ambassador Program is a follow-up mailout including a conservation pledge form. We once again encourage you to fill out this pledge form and return it to Nature Saskatchewan. We acknowledge those who have already taken the

the assessors to most of the sites. Everyone who attended learned about the importance of good shoreline management. At a potluck supper that followed, a formal presentation by Mr. Clive Callaway made for a very informative and interesting social evening. We hope all that attended enjoyed it.

PARCS had an information display that was tended by Mr. John Cameron. As stated previously, PARCS has been our best friend and has helped to promote our Association at every opportunity, and we thank them for all their support and were happy that they joined us.

Big Shell Lake had a couple of very heavy rain falls this summer. I'm sure all residents saw the effects of unprotected shorelines and the tremendous erosion that took place as a result of the heavy run-off. Heavy run-off such as we saw during these storms washed many nutrients into the lake and the result was a very heavy algae growth. Shoreline erosion is the greatest source of nutrient loading of a lake, and it is the easiest condition to remediate. When will we learn that we cannot continue to alter shorelines and destroy bordering wetlands. These are nature's most efficient protectors and filters of the lakes and rivers that we enjoy so much. This is the foundation and principle for existence of the *Living By Water* Project and the Saskatchewan Wetland Conservation Corporation. It's time we all "take up the cause" and change the way we use our lakes, or we may not have a usable lake 20 years from now.

Adele & Eugene Belyk receive the Shoreline Ambassador Certificate presented by Doug Wilson and Margaret Skeel

The Living by Water Project Pilot
by Tara Schmidt

Big Shell Lake was the site of Saskatchewan's first pilot of The *Living by Water* Project's Shoreline Ambassador and Homesite Assessment Programs. The pilot was held at Big Shell Lake on the beautiful summer weekend of July 21-23, 2000.

Everyone at Big Shell Lake is invited to become a Shoreline Ambassador, to adopt more environment-friendly lifestyles to "save time and money, naturally, and protect your health and wealth, naturally". Let's see how many Shoreline Ambassadors we will have at Big Shell Lake! You are a model for other groups.

The July 21-23, 2000 weekend itinerary included six Homesite Assessments, an open house, a presentation and a social evening, complete with a potluck supper. We were very excited to have Clive Callaway, co-founder of The Living by Water Project, perform the Homesite Assessments. The residents who attended the weekend workshop received invaluable information regarding healthy water and shorelines. We thank all who participated to make the weekend a success! We would like to extend a special thanks to the six families who volunteered their homes and time for a homesite assessment: Andrew and Myrtle Marquis, Carl and Jackie Brown, Dennis and Beth Johnson, Ernie and Audrey Rawlyk, Gene and Adele Belyk, and Jack and Marie McMunn. The Homesite Assessment manual is currently being revised to incorporate ideas forthcoming from the pilot at Big Shell Lake.

We would also like to express gratitude to Big Shell Lake Watershed Stewardship Association for partnering with The Living by Water Project to make this pilot possible. We hope other stewardship and cottage groups will follow in your footsteps and "work towards healthier human and wildlife habitat along the shorelines of Canada".

The final phase of the Shoreline Ambassador Program is a follow-up mailout including a conservation pledge form. We once again encourage you to fill out this pledge form and return it to Nature Saskatchewan. We acknowledge those who have already taken the

initiative to make a pledge to protect, conserve, restore or enhance their piece of shoreline. Waterfront residents across Canada are making pledges and the cumulative effects of individual positive actions **can** make a difference to keep your paradise intact!

Vol. 8 Summer 2001 - Homesite Assessor Training Workshop

Residents of Big Shell Lake are invited to attend a Homesite Assessor Training Workshop to be held this summer at Big Shell Lake. The workshop will provide tips for and information on:

- Providing effective and friendly service
- Providing advice to waterfront residents
- Using Conservation Marketing to promote Homesite Assessment visits
- Integrating elements of the Shoreline Ambassador Program and Shoreline Action Program into the Homesite Assessment Program
- Reporting and record keeping

Workshop Format

The workshop includes a 1 to 2 hour indoor session facilitated by a *Living by Water* Project Homesite Assessor Trainer, followed by a 1 to 3 hour in-the-field session where 1-3 model Homesite visits will take place. The day will finish with a 1 hour debriefing and question and answer session.

Due to the in-the-field component, the numbers of participants will be kept small.

You are encouraged to find 2 to 3 local waterfront residents who would volunteer their property for a model homesite visit. Ideally, the properties would be able to highlight some of your main areas of concern or common problems that affect shoreline properties in your community.

Support materials will be provided: The *Field Guide for Homesite Assessors* and *On the Living Edge: Your Handbook to Waterfront Living.*

For more information, contact Doug Wilson at 306-427-2128.

The Saskatchewan Network of Watershed Stewards (SNOWS)

Vol. 9 Fall 2001 – Saskatchewan Network of Watershed Stewards

by Don Dill

In the fall of 2000, a working group was formed to take a lead role in coordinating and supporting a more co-ordinated watershed stewardship program in Saskatchewan. This proposed program, called the Saskatchewan Network of Watershed Stewards (SNOWS) will be a partnership involving provincial (Sask Water, SERM, SWCC, SARM), federal (PFRA, Fisheries Oceans Canada, Environment Canada) and non-government organizations (PARCS, PFSRB, DU). The objective is to foster public involvement in the management and protection of our watersheds. It is intended that by providing the first point-of-access, there will be less duplication of effort between agencies, a greater degree of cooperation and coordination in developing projects, and easier access to information for watershed stewards. While SNOWS should save time, effort and frustration for those involved in stewardship activities, the ultimate goal is healthy aquatic ecosystems.

Currently, SNOWS is in the organizational stage. Money has been donated from DU to hire a temporary co-ordinator. Over the winter it is hoped that an office can be established, the governance structure can be finalized, a web site can be established and a communication plan can be developed. Once the organizational activities are completed, it is hoped SNOWS will act as a resource to new and existing groups seeking guidance in watershed stewardship activities / protection of our aquatic environment. As an organization already involved in stewardship activities BSLWSA can play an important role as a resource for other groups wishing to become watershed stewards.

If you have any questions or want more information about this new organization you can contact: Don Dill from Sask Water, 306-446-7456.

Appendix E: Seminar and Convention Reports

Vol. 3 Winter 1998/99 – Reflections on NALMS Symposium

by Don Dill

My reasons for attending the NALMS conference held last November in Banff were several fold. They included obtaining information from other areas of the world that could be applied to our local situations, and meeting and being inspired by other individuals and groups that have the same love for their local environment and are working towards protecting their lake or stream. Some of the ideas and thoughts that might be applicable to your lake association include:

- organizing a lake clean up day in which stewards would travel in canoes around the edge of a lake to clean up debris
- at Pine Lake, close to Red Deer, Alberta, the local restoration society sponsors a clean lake day which includes a variety of fund raising events. They were able to net $15,000 last year through this event. The same group installed a hypolimnetic withdrawal system last summer to siphon off some of the Phosphorous (P) rich bottom water which was contributing to excess algae in their lake. Fifty volunteers worked for three weeks to install the system. What dedication!
- Community participation is the key to the success of projects. Public exposure helps bring in public participation, public participation brings in politics, politics brings money. Keys to success include patience, energy, leadership, partnerships and faith.
- remember, everyone wants a better environment
- activities of stewardship groups can include: websites, GIS mapping, travel displays, WQ report card, shoreline remediation, stormwater runoff controls, habitat inventory, model zoning bylaws
- the Federation of Ontario Cottage Owners Association coordinates a lake stewardship program that includes monitoring at 250 lakes. The stewards monitor water clarity and P and are also monitoring for invasive species (Purple Loosestrife has been identified in the Lac La Peche area in 1997). They will be publishing a how to manual in 1999, called *Take the Plunge*, to guide lake associations in implementing lake stewardship
- the near shore area is the most important for fish spawning. Leaving area natural is the best option. Installing rip rap (rocks) is better than straight walls.
- studies in northern Alberta indicated an increase in P in lakes when forest harvesting in the watershed is compared to forest fires. The forest harvesting also promotes conditions that favour toxin producing algae.
- producing a video is a good way to send a strong message and gain credibility but an association needs to accompany film crews to ensure the video has the right emphasis
- preparing a lake fact sheet is a good way to communicate information about your lake
- most associations have volunteers collecting data. Data collected most often includes secchi dish (Transparency), P, Chlorophyll (indicator of algae) and precipitation. Training and equipment is provided to volunteers. Collecting data helps gain an understanding of the relationship between secchi depths, P, and algae within your lake.
- Water Survey of Canada often has extra equipment that may be available for use.
- lakes are highly valued for their ecological functions and for recreational opportunities but they also contribute to social needs that are conditions for a sustainable society. They provide aesthetic opportunities, collective security, cultural opportunities, economic opportunities, educational opportunities, emotional security, individual freedom individual security, recreational opportunity and spiritual dimensions. **We do need to take care of our lakes.**

Vol. 3 Winter 1998/99 – Reporting on NALMS Symposium (Nov. 10-13, 1998)

by Doug Wilson

The BSLWSA is a pilot project water quality study being conducted as a joint community effort with the Resort Villages of Big Shell, Echo Bay, R.M.s of Spirit-

wood, Meeting Lake & Leask, SERM, Sask Water and PFRA Canada through the AGRI-FOOD INNOVATION FUND. BSLWSA sponsored my attendance to the 18th International Symposium of the North American Lake Management Society (NALMS) in Banff, AB from November 10-13, 1998.

The purpose of NALMS Society is to promote further understanding of lakes, ponds, reservoirs, and impoundments, and their watersheds; the ecosystem of which they are a part; and their protection, restoration and management.

This symposium was attended by delegates and session presenters from all over the world. The theme of this symposium was *Co-operative Lake and Watershed Management Linking Communities, Industry and Government.*

We tend to think that our project in the Big Shell Lake Watershed seems small and insignificant from a stakeholders view for interest, support and co-operation. But in truth, we are a small but very important and necessary project for the long term quality and health of our watershed environment. We are but one small cog in a much larger wheel.

I listened to presenters from Europe, Africa, South America, Canada and the United States. Some of these projects have been underway for as many as twenty years. Some, like ours, are just beginning to get a study project under way. Most were 5-6 years into their projects.

What seems to be the most common findings is high nutrient loading of lakes and rivers with phosphates and nitrates. These are caused not only by man's mismanagement of his environment but also from natural sources. The main concern that kept coming up about the causes of water quality problems was the off shore uses of these water systems by cottage and home owners on lake and river front properties. Agricultural operations, mainly intensive livestock business, using shoreline water supplies for corrals and pasturing of cattle and hogs is another. In one case in Quebec a "Fish Farm" was polluting a recreational lake so badly that they were ordered to close after a costly court battle which lasted over 4 years between the operator and lake residents.

The combined effect of shoreline alterations by many property owners on a lake destroys habitat and water quality. The results are found in declining fish and wildlife populations. It's ironic that many lakeshore property owners purchase their lots because they enjoy nature and then unknowingly harm habitats by altering the natural landscape. Most species of fish and wildlife can't live along sandy swimming beaches or on mowed lawns. They prefer the tangles of aquatic "weeds" and shoreline brush that lakeshore owners frequently remove. "Clean" lawns make dirty lakes. Natural shorelines are wildlife highways for birds and animals alike. We all like to watch nature's creatures, let's not destroy their highways. Clean and clear shorelines aren't necessarily good for lakes and water quality. Soil erosion has been mentioned many times in sessions at this NALMS Symposium as a major cause of nutrient loading of lakes and rivers. As a result of these many years of study in districts around the world, remedial solutions have now been developed to correct many of these problems. In the BSLWSA, we are now at the point of identifying causes in our watershed. Next, is the remedial solutions. If we can get co-operation of all our property owners, through education we may be able to stabilize our lake and slowly, over time, show improvement.

On the grand scale of all the lakes and watersheds in Saskatchewan, Big Shell Lake is no worse or better than any other. A lake body, like a human body, goes through an aging process. What we do with our lake shore property can and does greatly affect this aging process.

The BSLWSA Board of Directors has a vision. Our properties at the lake continue to attract us. They remain places for recreation and rest. Our common lakeshore and lake quality is protected only if each of us considers the consequences of our actions. Information about impacts, alternatives and environmentally friendly actions around your cottage are available from all BSLWSA directors. This should be the vision and concern of every person in Saskatchewan, no matter which lake or watershed your cottage or farm operation is in.

Vol. 7 Fall 2000 – Convention Report

by Doug Wilson

The BSLWSA attended the annual conventions of: Canadian Water Resources Assoc., Partners for the Sask. River Basin, Provincial Association of Resort Communities of Saskatchewan (PARCS), and the Canadian Coalition of Provincial Cottage Associations.

Having our display boards and information table set up at these conventions greatly increased awareness by exposing our association to the convention delegates. The BSLWSA were also session presenters and used these opportunities to further promote our programs and the valuable data that has been gathered within our watershed.

Topics were varied, but the main theme was the overwhelming concern about ground and surface water contamination. Every jurisdiction has serious ground water quality problems. General consensus is the effect of intensive livestock operations and human liquid waste sewage are the major contaminates. Every presenter, no matter where they resided had the same message, we **must** correct this source of contamination **now**.

Delegates from Ontario to Alberta had expressed, in vivid details, these problems in their provinces. Manitoba delegates were greatly concerned of the effect of the growing number of large hog operations. The Alberta delegates raised these same concerns but included the concentration of large cattle feedlots in their province.

There was much discussion also about the situation of human sewage disposal and seemingly lax enforcement of regulations. Many resort communities expressed concern about holding tank and septic system failures, some of which were apparent planned failures by the cottage owner. There was discussion about cottage owners by-passing gray water from the holding and septic systems. I heard the comment, "They invest $100,000 plus in their cottage but won't spend $2,000 for a safe sewage disposal system."

As I attend more of these conventions and hear and learn from residents from other parts of Canada and abroad it emphasizes the urgent need for the BSLWSA board to inform residents of the Big Shell Lake Watershed that we must correct our infractions. We do have infractions in our resorts and farm communities. It will be to the benefit of all present and future residents to correct all and any infractions now. Our water quality and safety depends on it!

PARCS REPORT

Once again the BSLWSA was a major representative and sponsor at the annual convention of PARCS. We had our display booth set up and made a presentation on the BSLWSA program of Lake Stewardship. Our attendance is our most visible promotional tool to increase awareness to residents of Saskatchewan. Since our formation the PARCS organization has been our strongest supporter. The PARCS board of directors each year presents their "Recognition and Appreciation Award" for leadership in providing guidance, direction and support to the PARCS board. It is with humble pleasure that I announce that the 2000 Award was presented to myself, Doug Wilson, for work done for the BSLWSA. I sincerely thank President, David Field, their Executive Director, Lester Hunt, and the selection committees for allowing me to be included in this select group of awardees.

This year the Canadian Coalition of Provincial Cottage Associations (CCPCA) joined with PARCS for this convention. Representatives attended it from Ontario through to British Columbia. Highlights included presentations from each provincial association, government agencies including: SERM, Sask Water, Sask Municipal Affairs, Culture and Housing. Other topics discussed were Waste Management, Clear Cutting, Boating Safety, Lake Stewardship and Taxation. It was a fabulous experience and I thank the BSLWSA board for allowing me to attend. All cottage owners are urged to take out an individual membership ($20.00) to belong to this great lobby organization. PARCS has been the BSLWSA's biggest supporter. PLEASE RECIPROCATE!

Contact: PARCS Office, Box 9387, Saskatoon, SK S7K 7E9, Phone: 306-374-1028, Fax: 306-373-5526, parcs99@sk.sympatico.ca, http://www.saskcottage.com

Vol. 7 Fall 2000 – Highlights of the Western Beef Development Centre

by Karen Benjaminson and Brant Kirychuk

Termuende Research Farm Annual Field Day

by Karen Benjaminson

PFRA, SAF, and BSLWSA planned a bus tour from the Shell Lake and Blaine Lake areas to the WBDC field day. Flyers advertising the tour were mailed out but only one person pre-registered, so the bus was cancelled. However, several more farmers expressed interest in attending the field day so Brian Harris, SAF, and Karen Benjaminson, PFRA arranged for two vans to take people to the field day. One van was PFRA's, the other was rented and paid for by BSLWSA's AFIF funding. Everyone enjoyed the tour and learned about

the many different livestock watering options demonstrated and discussed at the WBDC. In addition to the Effects of Water Quality on Cattle Weight Gain study, other projects viewed and discussed by the tour participants are described below.

Best management practices using watering systems for livestock on pasture

Demonstration of summer and winter watering systems for dugouts including: wind, solar and electric aeration; solar pumping into troughs and nose-pumps. Exclusion of livestock with fencing. Re-seeding of dugout slopes with forages, shelterbelts and grassed runs for runoff water collection.

Establishment and demonstration of grazing or haying cicer milkvetch/meadow bromegrass and alfalfa/meadow bromegrass forage

Evaluating the grazing and production potential of meadow bromegrass and cicer milkvetch as compared to meadow bromegrass and alfalfa pastures.

Establishment and demonstration of grazing legumes for the black soil zone

Establishment and grazing demonstration of sainfoin, cicer milkvetch and AC Grazeland BR (low bloat alfalfa). Forage quality, production, and animal grazing data are being collected.

Evaluation of annual crops for extending the grazing season

Demonstration and evaluation of: grazing corn, barley, oats and fall rye for fall and winter grazing with beef cattle.

Hog manure application on Russian wildrye pasture

Long term effects of hog manure injected into an established Russian wildrye pasture at 50, 100 and 200 lb. N/acre on forage yield and quality.

Establishment and demonstration of smooth bromegrass, smooth bromegrass/alfalfa and intermediate wheatgrass/alfalfa for hay production

For more information contact the Western Beef Development Centre or try their new website: http://www.wbdc.sk.ca.

Effects of Water Quality on Cattle Weight Gain

By Brant Kirychuk, Head, Range Management and Angela Street, Water Quality Unit.

More than 350 people attended the Western Beef Development Centre's (WBDC) annual field day at the Termeunde Research Farm near Lanigan, SK, on June 22, 2000. PFRA hosted two of the tour stops during the field day: best management practices for off-site watering and the effect of water quality on weight gains in cattle. PFRA is collaborating with WBDC on these projects. A number of options for off-site watering were demonstrated for the visitors, while first year results and ongoing research were explained at the water quality study site.

Livestock producers have become very interested in off-site watering and water quality due to a number of environmental issues and the fact that research is showing a production and economic benefit to supplying good quality water to cattle.

Livestock typically obtain their drinking water from low quality sources, such as a dugout. However, research indicates that cattle, like humans, are sensitive to the taste and odour of water. It has been suggested that providing cattle with better quality water will cause them to drink more, eat more and ultimately gain weight more quickly. Research also shows that improved water quality can lead to decreased health problems in animals.

The weight gain study examined feeder steers in 1999 and has added cow/calf pairs to the project in 2000.

Four types of water are being evaluated: directly accessed dugout water; dugout water pumped to a trough; aerated dugout water pumped to a trough; and coagulated and chlorinated dugout water pumped to a trough.

Each of the groups of yearlings and cow/calf pairs have access to only one of the four types of water.

Allowing cattle direct access to a dugout results in a decrease in water quality due to faecal contamination, and increases the potential for the transfer of diseases between animals.

The unaerated water pumped to a trough does not undergo the same type of degradation since cattle do not have direct access to the dugout. However, the lack of oxygen results in the water having a bad taste and odour.

The quality of the aerated dugout water is better than the unaerated because the oxygen makes water

more aesthetically pleasing and helps prevent the formation of undesirable gases.

The coagulated and chlorinated water has the highest quality of the four types being tested. Coagulation is highly effective in removing impurities such as colour, turbidity, phosphorus and dissolved organic carbon.

Larry Braul, Water Quality Engineer, Technical Services, has come up with the following calculations based on the study's first year of data. The calculations assume a 100-head herd with a long-term average steer price of $1.00 per pound.

Remote watering

- Cost of solar panel, intake, pump, hose, and trough—$1,500.
- Weight gain over direct access—0.14 lb. per day.
- Financial gain—$14 of extra beef per day.
- Time to recover $1,500 cost—about 110 days.

Aeration

- Remote watering costs plus compressor, hose and airstone—$3,800.
- Weight gain over direct access—0.38 lb. per day.
- Financial gain—$38 of extra beef per day.
- Time to recover $3,800 cost—about 100 days.

Coagulation

- The above costs plus $6,000 for lining dugout and $300 per year for chemicals.
- The first-year results showed no gain in cattle growth over that of aeration.
- To be justified, based on cattle production alone, weight gains would have to be about 0.48 lb. per day.
- Costs could be spread over family use and improved water for mixing with pesticides.

An additional two years of research is being conducted to verify results. A technical report on the research project is available on PFRA's website at www.agr.ca/pfra/water/dgcattle.pdf.